



UNIVERSITETET I
NORDLAND

HANDELSHØGSKOLEN I BODØ • HHB

MASTEROPPGAVE

Employee-Driven Innovation in the Public Sector

Alisa Gurova

Mikhail Kurilov

BE307E - Entrepreneurship and innovation management

May 2015



Preface

The current master thesis is a final part of our Master of Science in Business program. It was a pleasure for us to study at the University of Nordland in Norway. During these two unforgettable years we have gained incredible life and academic experience. We have learned a lot of things that we are sure will be useful for our future. This academic journey would not have been such a great and inspiring that it is now without all those people who have contributed in it.

We would like to thank our supervisor Professor Tommy Høyvarde Clausen for inspiring us to explore the topic of innovation in the public sector, for his support and help in conducting research. It was a pleasure to work with you.

In addition, we would like to express gratitude to all the teachers from our specialization “Entrepreneurship and Innovation Management”.

Particularly, we want to thank Erlend Bullvåg for his amazing sense of humour and constant support he was giving us. After talking with you all difficulties seem surmountable and it gives strength and self-confidence. Additionally, your style of teaching made the lectures incredibly interesting and exciting and it deserves a special respect.

Special thank you goes to Espen Isaksen for his openness, willingness to help and readiness to provide a support for the thesis. Your advices during midway presentations were very useful for us.

In addition, we would like to thank Gry Alsos for her positive attitude, comments and tips in the course of work on the master thesis.

Without the support of our families, it would have been difficult to achieve what we have now reached. We want to say a heartfelt thank you to our families who believed in us and supported in all undertakings.

After four month of intense work we are pleased to present our master thesis! We hope the thesis will be a navigator in the field of innovation in the public sector and will help readers and researchers deeply understand the concept of employee-driven innovation within the framework of the public sector. The paper would be a good basis for further research in the sphere of employee-driven innovation in the public sector.

Abstract

This master thesis is a research work in the field of innovation in the public sector. The general purpose of this research is to explore employee-driven innovation phenomenon in the public sector with a particular focus on the investigation of the factors influencing employees' innovation ideas and innovation effect in the public sector. The research question is concerned with identifying the relationship between ideas from employees and the innovation effect in the public sector, and determination of factors influencing them. The results are based on a quantitative analysis method and were obtained through Innobarometer survey 2010.

Some of data applied in the analysis in this publication are based "European Commission's "Flash Eurobarometer 305 (Innobarometer 2010). The data are provided by TNS GALLUP Organisation, Brussels, and prepared and made available by the Norwegian Social Science Data Services (NSD). Neither European Commission, TNS GALLUP Organisation, Brussels nor NSD are responsible for the analysis/ interpretation of the data presented here.

The data analysis revealed some interesting results. First of all, it was supported that ideas coming from employees lead to the positive innovation effect in the public sector. Thus, this fact emphasizes the importance of employees' ideas as a source of information for innovation development of public sector organizations. Secondly, factors such as incentives, workforce skills, education, management support, top-down decision making strategy, favourable environment and barriers were derived from the theory and were tested in accordance with developed research model. The analysis of the model revealed some interesting and surprising results. For example such factors as education, favourable environment and barriers affect the model differently not as expected in the theory.

Keywords: innovation, the public sector, employee-driven innovation.

Table of contents

Preface	i
Abstract	ii
Table of contents	iii
Survey of tables	iv
Survey of figures	v
Survey of appendix.....	vi
1. Introduction	1
1.1 Background and purpose of the research.....	1
1.2 Research question	3
1.3 Structure of the thesis	3
2. Theoretical insights	5
2.1 Innovation and public sector.....	5
2.1.1 What is the public sector?	5
2.1.2 What is innovation?.....	7
2.1.3 Innovation in the public sector	8
2.2 Employee-driven innovation	13
2.2.1 Introduction to the employee-driven innovation	14
2.2.2 Employee participation in innovation process	16
2.2.3 Opportunities and limitations of employee participation.....	17
2.2.4 Structures of innovation decision-making.....	17
2.3 The concept of employee-driven innovation within the public sector	19
2.3.1 Factors influencing on employee-driven innovation.....	22
2.3.2 Factors influencing innovation ideas from employees and innovation effect in the public sector.	26
3. Research model	31
4. Methodology	33
4.1 Philosophical concept of the research design	33
4.2 Research design	35
4.3 Unit of analysis	36
4.4 Sampling and data collection.....	36
4.4.1 General limitations of IB survey	38
4.5 Data analysis.....	39
4.6 Validity and reliability	40
4.7 Summary.....	44
5. Results of the data analysis	45
5.1 Factor analysis	45
5.2 Preliminary analysis	50
5.3 Hypotheses 1, 2, 3, 4. Regression analysis	51
5.4 Hypotheses 5, 6, 7 and 8.....	57
5.5 Discussion.....	73
6. Conclusion and implication.....	81
6.1 Limitations of the research	81
6.2 Further research	85
Literature list	87
APPENDIXES	94

Survey of tables

Table 1. Possible innovation incentives in the private and public sector..... 24

Table 2. Overview of items 41

Table 3. Factor analysis (varimax rotation) computed with 33 items of the Innobarometer questionnaire 47

Table 4. Descriptive statistics and Pearson correlation matrix of the dependent and independent variables..... 50

Table 5. Bivariate regression analyses of the relationships between ideas from employees and positive effects of innovation 52

Table 6. Multiple regression analyses between ideas from employees and positive effects of innovations controlling the influence of other factors..... 53

Table 7. Bivariate regression analyses for Hypothesis 2 (H2), Hypothesis 2 (H2), Hypothesis 3 (H3)..... 54

Table 8. Multiple regression analysis between incentives (H2), workforce skills (H3), education (H4) and ideas from employees (all three hypotheses are tested in one regression model). 55

Table 9. Support status for the hypotheses..... 74

Survey of figures

Figure 1. Structure of the master thesis.....	4
Figure 2. Ideal type organizational structure of traditional innovation decisions.....	18
Figure 3. Ideal type organizational structure of an employee-driven innovation	19
Figure 4. Hypothesis 1	21
Figure 5. EDI model.....	22
Figure 6. Research model of employee-driven innovation and innovation effect in the public sector	31
Figure 7. A conceptual diagram of simple mediation model	58
Figure 8. A simple mediation model with control variables	58
Figure 9. Model of management support as a predictor of positive effects of innovations, mediated by ideas from employees	61
Figure 10. Mediation model with path coefficients for Hypothesis 5.....	63
Figure 11. Model of top-down decision making strategy as a predictor of positive effects of innovations, mediated by ideas from employees.....	64
Figure 12. Mediation model with path coefficients for Hypothesis 6.....	66
Figure 13. Model of environment as a predictor of positive effects of innovations, mediated by ideas from employees	67
Figure 14. Mediation model with path coefficients for Hypothesis 7.....	69
Figure 15. Model of barriers as a predictor of positive effects of innovations, mediated by ideas from employees	70
Figure 16. Mediation model with path coefficients for Hypothesis 8.....	73

Survey of appendixes

APPENDIX 1: Survey.....	94
APPENDIX 2: Total Variance Explained by factors	104
APPENDIX 3: Scree Plot.....	105
APPENDIX 4: Full output of reliability analysis.....	106
APPENDIX 5: Full output for bivariate regression analysis of Hypothesis 1	111
APPENDIX 6: Full output for multiple regression analysis of Hypothesis 1.....	112
APPENDIX 7: Full output for bivariate regression analysis of Hypothesis 2.....	114
APPENDIX 8: Full output for bivariate regression analysis of Hypothesis 3.....	115
APPENDIX 9: Full output for bivariate regression analysis of Hypothesis 4.....	116
APPENDIX 10: Full output for multiple regression analysis of Hypotheses 2, 3, 4.....	117
APPENDIX 11: Full output for mediation analysis of Hypothesis 5	119
APPENDIX 12: Full output for mediation analysis of Hypothesis 6	122
APPENDIX 13: Full output for mediation analysis of Hypothesis 7	125
APPENDIX 14: Full output for mediation analysis of Hypothesis 8	128

List of Acronyms

EDI – Employee-Driven Innovation

EU – European Union

IB - Innobarometer

NPM - New Public Management

OECD – Organization for Economic Cooperation and Development

WTO - World Trade Organization

1. Introduction

The chapter represents the master thesis by introducing the research topic through the discussion of its background, research purpose, research question and structure of work.

1.1 Background and purpose of the research

It is widely recognized that innovations have an impact on economic development (Koch & Hauknes, 2005). The topic of innovation has been deeply investigated by scholars in the private sector. However, there are only few studies has been conducted on this topic in the public sector. Public sector innovation makes contribution in social and economic development of the states. The need to improve the quality and efficiency of public services makes innovation an essential part of the public sector (Golubeva & Sokolova, 2009). Therefore, it is important to explore different approaches and factors that foster and support innovations in public sector organizations. One of the approaches to innovation is called employee-driven innovation (EDI) and it is the theme of the present investigation.

Employee-driven innovation has been a hot topic of discussion for a few decades and researchers are still interested in exploring this issue (Herstein & Mitki, 2008; Bakker & Demerouti, 2008). It has been shown that a growing number of both private and public organizations have implemented the employee-driven innovation approach in order to encourage employees to suggest ideas for new products, services and ways of improving innovation processes (Teglborg-Lefèvre, 2010). Traditionally innovation in the public sector is viewed as a result of ‘top-down’ approach, i.e. policy makers’ level decisions (Hartley, 2005). Little attention is given to the study of “bottom-up” approach within the public sector. Therefore, the attention of our master thesis is concentrated on the study of bottom-up approach to innovation in the public sector.

Employees are important actors in the innovation process and they can make a great contribution in the organization development. Employees’ participation to innovation is a powerful instrument for the organizations that strive for being more competitive in the market (Bloch, 2011). Nowadays more and more employees aspire to fulfil their potential at work. They are willing to use their skills in order to make a contribution to innovation development of an organization, even if it is not their direct responsibility. They often want to be involved into the innovation process, because in this way they can feel themselves as a part of a company. It has been argued that interest in the job increases if employees can contribute to

the company development. However, the power of human capital is often underestimated (Kesting & Ulhøi, 2010). Thus, organizations which utilize employee's potential to innovate are more successful and innovative. The use of employee-driven innovation approach in the public sector is no less important than in the private sector. The public sector needs to innovate due to its increasing role in the socio-economic development of the states and countries. Hartley (2005) recognised that innovation public sector is much more a 'bottom-up' process. Moreover, Borins (2002) claimed that majority of innovations in the public sectors comes from middle managers or front-line staff. Therefore, it is reasonable and important to study EDI in the public sector.

The present research project investigates employee-driven innovation in the public sector by focusing on different theoretical perspectives concerning factors fostering employees to innovate in the context of the public sector.

It would be also interesting to examine what would be the innovation effect in the public sector from employee-driven innovation approach. There is a lack of studies concerning innovation effect in the public sector, particularly if innovation idea comes from employee. Therefore, it is necessary to investigate the relationship between employee-driven innovation and innovation effect in the public sector.

Based on the background described above, the general purpose of this research is to explore employee-driven innovation phenomenon in the public sector and examine the subsequent innovation effect, with a particular focus on the investigation of the factors influencing employees' innovation ideas and innovation effect in the public sector.

The current research contributes to the literature about innovation in the public sector, taking into consideration how they occur, through examining employee-driven innovation phenomenon and influencing factors. Factors affecting employee-driven innovation have been studied only in private sector organizations and have not been investigated in the public sector yet. The paper also examines innovation effect from employee-driven innovation in the public sector. This effect has been poorly researched in this particular sector, thereby it gives rise to the study of this area.

All in all, the master thesis will help better understand and respond to the dynamics related to employee-driven innovation in the public sector. The comprehension of factors influencing

the employee's participation in innovation will enable public servants to manage the process of innovation effectively in order to enhance social welfare.

1.2 Research question

Based on the discussion above the current research investigates employee-driven innovation in the public sector by focusing on different theoretical perspectives concerning the factors fostering employees to innovate in the context of the public sector, i.e. the purpose of the work is to identify these factors, and moreover, to trace the innovation effect in the public sector. It leads us to the research question, which comprises two parts. The first one is formulated as: *“How ideas from employees influence the innovative effect in the public sector?”*. And the second part is – *“What factors affect employee-driven innovation and innovation effect in public sector organizations?”*.

To answer the research question two main domains underlying it must be specified. The first domain refers to innovation in the public sector. It is important to know various types, classifications and features of innovation with regard to the public sector in order to form a clear understanding. The second domain is employee-driven innovation, which has an impact on innovation in the public sector. Since employee-driven innovation has different visions of defining it, the borders of the concept applying in the research have to be determined in accordance with the relevance to the public sector.

1.3 Structure of the thesis

The structure of the present project consists of the following 6 sections (see Figure 1) and starts from the introduction chapter, where the purpose and research question are formulated based on the research background.

In order to form a clear understanding of the theme of conducted research and to answer the research question, a theoretical insight of applying concepts will be broadly discussed in chapter 2 through the literature review. The second chapter covers required definitions of innovation and the public sector backed by some relevant discussion. And also it provides insights about existing types and classification of innovations and discusses possible drivers for innovations in the public sector. Further, chapter 2 makes a transition from basic concepts to employee-driven innovation phenomenon, and implement this phenomenon in the public sector. Factors influencing employees' innovation ideas and innovation effect in the public sector are going to be discussed and relevant hypotheses will be put forward.

Chapter 1	<u>Introduction</u> : background, purpose of the research, and research question
Chapter 2	<u>Theoretical insight</u> : innovation and public sector, employee-driven innovation, employee-driven innovation within the public sector, factor influencing employee-driven innovation, factors influencing ideas form employees and innovation effect; postulating hypotheses
Chapter 3	<u>Research Model</u> : summing up all hypotheses in the research model
Chapter 4	<u>Methodology</u> : philosophical concept, research design, unit of analysis, sampling and data collection, approach to data analysis, validity and reliability of the research
Chapter 5	<u>Results of data analysis</u> : factor analysis, preliminary analysis, testing hypotheses
Chapter 6	<u>Conclusion and implication</u> : Discussion, limitations, further research

Figure 1. Structure of the master thesis

Based on the theoretical insight chapter 3 will summarize postulated hypotheses in the research model.

Chapter 4 will reveal the methodology, methods and techniques that will applied in the work. This chapter will describe methodology of the research through philosophical assumptions, research design, unit of analysis, sampling and data collection, approach to data analysis, and then will address the issues of validity and reliability.

After defining research methodology data analysis and hypotheses testing will be carried out in the fifth chapter. The results will be analysed and presented. Further discussion of empirical findings, all limitations and implication will be described in the conclusion in chapter 6. The chapter will summarize the key findings obtained through the research and indicates the direction for further research.

2. Theoretical insights

2.1 Innovation and public sector

Before defining what innovation in the public sector is, it is necessary to clarify basic concepts of the public sector and innovation. There is a number of approaches to the definition of what the public sector is as well as how innovation in the public sector can be classified. The next sections of this chapter cover important steps necessary to create a comprehensive basis for the understanding of the innovation in the public sector. At first, different approaches to definition of the public sector and issues related to it are discussed. Then, different types, classifications and features of innovation in the public sector are investigated.

2.1.1 What is the public sector?

Recent literature gives a number of approaches to public sector definition. These approaches differed from each other by its breadth of coverage of the public sector. Generally, the understanding of the public sector is based on establishing the boundaries between "public" and "private" sectors. According to this, Koch and Hauknes (2005) give the following criteria for dividing the public and the private sector in PUBLIN report such as product characteristics; ownership and control; funding; nature of the social surplus and benefits; competition characteristics. A generalization of these criteria leads us to the concept of "public governance" which provides a combination of characteristics of ownership, control, financing, beneficiaries and other stakeholders (Koch & Hauknes, 2005). However, the closer look on these criteria reveals that they all have conflicting characteristics.

The public sector has to produce only public goods, which characterized as *non-excludable and non-rival*. According the criteria, the public sector can be defined as group of organizations involved in the production of public goods (Koch & Hauknes, 2005:14).

Public sector organizations must have a collective ownership (Koch & Hauknes, 2005). However, this criterion also includes a "third sector" and institutions such as foundations. This creates points of contention again. Thus, we should focus our attention on functions and activities, which provided by organizations. In other words, the public sector includes the organizations, where the government has a dominant position as the owner of the subject and control, directly or indirectly, e.g., through funds (Golubeva & Sokolova, 2009). This definition refers to legal approach of defining the public sector.

According to the criteria of financial sourcing, all activities funded mainly by the public purse shall be included in the category of "public sector" (Koch & Hauknes, 2005). Sources of financing for activities lie at the heart of the financial approach to the definition of public sector division. According to this approach, in the public sector, in addition to government agencies, should be included private organizations, funded mainly by governmental funds, including - non-profit organizations, providing services in the social sphere (Golubeva & Sokolova, 2009).

Other approach is to look on the public sector through the nature of the social surplus or benefits generated the range of beneficiaries from its activities: if the nature of production and consumption is individual, then benefits are private; if the nature is collective then the benefits have a public character (Koch & Hauknes, 2005).

Bugge et al. (2011) suggests that for better insight it is necessary to mention the nature of public services. A number of characteristics of public services also applicable to services in general. The services in the public sector are intangible and they cannot be stored and invisible for customers beforehand as are not objects. Another characteristic is simultaneity. For most of the services production and consumption occurs at the same time what makes interaction with a client more important. Some services can be aimed for the broad auditorium while other may be customized to the individual user. The human factor, as the last characteristic, is very important for services that will lead to greater emphasis on employee competences and client interaction (Bugge et al., 2011).

The conditions for competition are also important. There are two types of provision: market provision, which has price competition, and non-market – which can be both competitive, and non-competitive (Koch & Hauknes, 2005).

The definitions of the public sector can be very various. The multiplicity of public sector definitions is explained by absence of a clear correspondence between the social responsibility field and organizations, providing socially important services (Golubeva & Sokolova, 2009). It also depends on starting point of your consideration. Khury (2002) outlines three definitions of the public sector organizations from legal, financial and functional perspectives. Koch and Hauknes (2005) based on these perspectives developed criteria for public sector definition.

The most encompassing definition of the public sector was formulated by Koch and Hauknes (2005:17) in Publin report within the framework of the functional approach. Accordingly with

this approach, the *public sector includes all organizations in the field of public administration, social security, law and order, education, health, social and cultural services, regardless their sources of funding source and the legal form of the supplier*. Considering innovation in the public sector, it is implied the utilization of the public sector due to this definition.

2.1.2 What is innovation?

The studies of innovation in private companies have greatly enhanced the knowledge and understanding of the processes that underpin the role of innovation within social and economic change in modern economies, especially after Schumpeter reflected upon the impact of innovation on economic development (Bugge et al, 2010).

The term innovation usually refers to creating something new such as a product, technology, process, etc. Schumpeter (1982) defined innovation as new combinations of existing resources and suggested five types of novelties: (1) production of fundamentally new product; (2) introduction new production technology, including a new method of commercialization of the product; (3) development of new markets; (4) access to new sources of raw materials, (5) and the changing of industrial organization. The definition of innovation can be narrowed according with two types of innovation: “product innovation” - creating a new product or service, and “process innovation” – improvement and optimization of the process (Fagerberg, 2006).

Division on product and process innovation can be seen important because their economic and social impact may be different. For example, the introduction of new product commonly leads to growth of employment and profits, while effect of process innovation can be controversial. Introduction of more cost-efficient technologies will cause dismissing of employees whose labour is no longer demanded (Edquist et al., 2001). Many economists argue that process innovation leads to a cost saving in a firm or industry and it will generate further demand and income in the economy as a whole. Furthermore, the product made by one firm may be used to produce goods or services in another firm, making these effects distinguishable at the level of companies and vague at the level on the overall economy (Fagerberg, 2006).

Another way to classify innovations laid down by Joseph Schumpeter is according to how radical they are. Due to this approach, a series of small improvements are often characterized as “incremental” or “marginal” innovations, and in opposite, “radical” innovations can be

seen as the introduction of something totally new or “technological revolutions”. It is generally accepted that the cumulative impact of incremental innovations is great and huge part of economic benefit, while radical innovations in most cases demand series of incremental improvements (Fagerberg, 2006).

Innovations can also be classified according to a hierarchal level on which entrepreneurs and the innovations they develop can be found. The first type is top-down innovation that means the process initiated on the high levels of hierarchy, by people in power who set targets and objectives. While bottom-up innovation means that the process was initiated at lower levels of hierarchy, by employees (Windrum et al., 2008).

Important to notice, that the meaning of innovation continuously develop. A common mistake is to consider certain and only one type. It should be taken into account, that different types of innovation create a verity of variables with different explanations (Armbruster et al., 2008; Damanpour and Gopalakrishnan, 2001).

The best recognition of modern innovation concept was found in the OECD (Organization for Economic Cooperation and Development) definition: “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD and Eurostat, 2005:46).

However, later on, the definition of innovation was widened by including social innovation such as organizational, policy, institutional innovation, innovation in services and innovation in the public sector (Golubeva & Sokolova, 2009). Introduction of this broad concept was necessary in order to cover innovation in the service sector, which dominates in the economies of all OECD countries (Franz & Lambert, 2008).

2.1.3 Innovation in the public sector

Since the terms "innovation" and "the public sector" are defined, it is time to reconcile these two notions and to talk about innovation in the public sector.

The public sector plays a key economic role as regulator, service provider, employer and make up the majority of economic activity in the developed countries. The contribution of public services to these areas will not be possible without strong participation of innovation in services. In addition, efficiency and productivity of the public sector positively influence on economic growth through its stewardship of the private sector. Innovation in public

administration has positive effects on improving user access to information, user satisfaction and increase the speed of services delivery. Also it will have a strong effect on public benefits such as improved productivity and higher living standards. Thereby, the topic of innovation in the public sector has the increased interest in the society (Hollanders et al., 2013).

However, a lot of promising reforms in public administrations ended with a failure. In spite of the benefits from innovations in general, an ineffective innovation in the public sector may be much graver than in the private sector (Gonzalez et al., 2013). This fact complicates the introduction of innovations in the public sector.

The range of public sector organizations is diverse as well as their role in the innovation process. They can produce and be important users of new innovations, they can play significant role in the development of technologies. In many cases public organizations play a crucial role as suppliers of complementary services and infrastructures that are necessarily for the private sector (Windrum et al., 2008).

Despite of common view that public sector is not innovative, Innobarometer 2010 on innovation in public administrations demonstrated that the public sector is highly innovative where two out of three public administration organisations introduced at least one service innovation. Ideas from staff, management and clients were the major sources of information used in developing innovations (Hollanders et al., 2013).

Gonzalez et al. (2013) suggest that in order to successfully create and implement innovations in the public sector it is necessary to have a credible leadership, believable managers who are leaders in innovation and the managerial team of individuals who collaborate with each other, because one person alone cannot lead innovation.

In order to understand what is commonly seen as public sector innovation, one can use the European Commission Report (2013). According to it, there is a consensus across countries and public administrations about definition of public sector innovation. By public sector innovation they suppose *means to meet growing budgetary pressures, through more efficient administration or service delivery, and new societal demands, through different and more effective service design* (Hollanders et al. 2013:4).

At the same time Osborne and Brown (2005) distinguish phenomena of change and innovation in the public sector, noticing overlapping. From their point of view change is a broad phenomenon that assume the gradual improvement or development of the existing services provided by public service organizations and represent continuity with the past. And

by the contrast, innovation is a specific, discontinuous form of change, representing a break with the past.

Gil-Garcia et al. (2014) argues that the phenomenon of innovation in the public sector has changed from value based concept to concrete goal with specific targets, making innovation as an objective for government administrators.

Windrum et al. (2008) suggested taxonomy of public service innovation in order to develop better understanding different types of innovation that are found in the public sector. This taxonomy consists from six types of innovation, in which the first three categories are similar to the private sector and other three categories address the public sector:

1. Service innovation, that introduces a new service or an improvement in the quality of an existing service a directly comparable with product innovations in manufactured goods;
2. Service delivery innovation, the innovation that involves new supplying of public services.
3. Administrative and organizational innovation, the innovation that changes the organizational structures and routines of service production;
4. Conceptual innovation, it is the development of new world views that challenge assumptions that underpin existing service products, processes and forms of organizations;
5. Policy innovation, it changes the thought and behavioural intentions associated with a policy belief system;
6. Systemic innovation, it introduces new or improves existing ways of interacting with other organizations and knowledge bases.

According Windrum et al. (2008), conceptual innovation introduces new missions, world views, objectives, strategies and rationales and can occur at all levels. This type of innovation is very important to organizations operating under public objectives as they link socio-economic objectives of a public organization and its operational rationale. Windrum et al. (2008) asserts that at the ministerial level policy innovation comes in forms of incremental innovation that base on policy learning by the government, and in radical forms innovation, caused by conceptual innovation. He associate policy innovations with three types of learning: learning of how policy instruments can be improved in order to achieve the goals; conceptual learning that comes next to conceptual innovations and follows changes in shared understanding of a problem and appropriate courses of action, and; social learning that bases on new ideas of social interaction and governance about shared understanding of the appropriate roles of policy actors and the rules for interaction change. Systemic innovations involve new or improved ways of interacting with other organizations and knowledge bases.

The interactions supposed by systemic innovations can be increasing role of service outsourcing, privatization, and the contracting out of public services.

Koch and Hauknes (2005) represent their view on types of innovation in the public sector. It is similar to previous taxonomy, but instead of policy innovation and service delivery innovation they introduced process innovation (a change in the manufacturing process of a service/product) and radical change of rationality (shifting of the world view or the mental matrix of the employees of an organization).

Traditionally innovation in the public sector is viewed as a result from 'top down' approach, from policymakers' level decisions and implemented by public management (Hartley, 2005). Nonetheless, Hartley (2005) recognised that innovation in the public sector is much more a 'bottom-up' process. Borins (2002) supports 'bottom-up' approach, proving by his research that majority of innovations comes from middle managers or front-line staff. There are also many researches that argue that innovations go from the both directions. However, hierarchy level on which innovation appear influence on the types of innovation, thus the ideas that come from middle management and front-line staff are more likely to generate incremental innovations due to that they are created to solve problems in specific locations with low probability to diffuse, while ideas from top-level management are more likely to end as larger-scale innovations (Hartley, 2005).

Windrum et al. (2008) regards hierarchal levels on which innovations can appear as one of the six factors that determine when and how innovation occurs, and whether innovation is successful. According his view, top-down innovations are mostly initiated with changes in governance frameworks or regulation and aimed to achieve greater efficiency in supplying of existing services. They take the form of political goals and less the form of detailed changes in specific services. Windrum et al. (2008) also argue the importance of public sector managers and service personnel that can be entrepreneurs as they are not subordinate to a political leadership. Their contribution in terms of innovations may be higher, because they are mostly university trained personnel with deep knowledge of their field, due to professional training and qualifications. While politicians, by the contrast, are generalists with some knowledge in many areas of policy and government. Other five factors revealed by Windrum et al. (2008) are incentive structures, public sector entrepreneurs, impact of New Public Management (NPM) on innovation and implications of consumerism. As incentive structures he divides facilitators for innovation on the aggregate (national) level and local level and gives particular importance to support of mechanisms that allocate resources to promote

creativity. Public sector entrepreneurs are risk-taking, creative individuals and motivated by social welfare seeking to change the world around them and create new ideas. They can provide radical innovations using well established connections within social networks to get the social and financial resources necessary for it. As another valuable quality of entrepreneurs that is crucial to for diffusion of the innovation, Windrum et al. (2008) highlights their ability to maintain their belief in innovations while meeting different obstacles. According NPM it is important for public sector managers to adopt private sector management skills and practices in order to deal with increasing demands for better quality of public services and the need to control public expenditure. Consumerism replaces the term citizens by customers that will change individual behaviour and will lead to greater efficiency or cost savings (Windrum et al., 2008).

Innovations spread in the public sector. This phenomenon can be explained by external innovation push and innovation pull created by the public sector itself.

Halvorsen et al. (2005) recognises a number of sources for innovation push. The first reason they mentioned was policies and political targets. Normally most of the countries have elections at the fixed time intervals, and when the time is coming to it point politicians burst with new party programs, ideas and innovations. Forcing the public sector to carry out their will creates push for change and innovation. Popular opinion can be another reason of innovation push in the public sector. Popular opinion supported and amplified by media may have a strong influence on politicians that will provoke innovations in the public sector and appearance of feedback loops in this process. Halvorsen et al. (2005) also highlight international agreements, laws, regulations and standards as cause of the external pull. Globalization and international organizations like EU, WTO influence on the domestic policy of individual states forcing ratification of agreements that ultimately leads to innovations in these countries.

The obvious and common reason for external pull for both the private and the public sectors is technological and scientific developments. There are also many other occasions that can lead to innovation in the public sector, even natural as well as anthropogenic.

As factors that creates a pull for innovation Halvorsen et al. (2005) suggest user needs and preferences, organizational overstretch, lobbyism and technological interdependencies. Public sector responds in order meet users' needs and preferences from bottom-up by daily interaction with citizens at the service level, and through the democratic channels in case of

top-down. Organizational overstretch happens when both citizens and employees feel both citizens and employees may feel manqué by the incapacity of public sector organizations to provide expected services that results in protests and forcing leaders to reform. Employers may be source of innovations by themselves for various reasons such as ideology, idealism or altruism and career promotion. Other reason may be lobbyism of private sector organizations that decided to defend unsatisfied users. And the technological interdependencies appear when innovator pursues innovation if other agents are trying to introduce similar innovations or if they solving the same problem but in other ways (Halvorsen et al., 2005).

Golubeva and Sokolova (2009) argue that the complexity of innovations diffusion ways in the public sector creates the need for political and bureaucratic support for their implementation. These ways are differ according the structure of public organizations. Decentralized structure promotes better diffusion of innovations. Different governments started to pay more attention to it and often taking steps to adopt decentralized management structures (Golubeva & Sokolova, 2009).

2.2 Employee-driven innovation

Employee-driven innovation (EDI) has been a hot theme for a few decades and still researchers are interested in exploring this topic (Scott, 1995; Sundbo, 1999; Borins, 2002; Nijhof et.al., 2002; Bessant, 2003; Jong & Hartog, 2007; LO report, 2007; Hallgren, 2008; Kesting & Ulhøi, 2008; Åmo, 2010; Kesting & Ulhøi, 2010; Teglborg-Lefevre, 2010; Telljohann, 2010). Employee participation in innovation process is a powerful instrument in order to be more competitive in the market. One person as a manger cannot lead innovation alone. Innovation is a comprehensive process, which involves participations of different parties. Organizations utilizing employee's potential are more innovative in the market. Thus, the theme of involving employees in the process of innovation becomes more and more popular nowadays in both the private and the public sectors.

This chapter will address the following questions: what actually does EDI mean? Which opportunities does EDI implementation give? How to apply EDI in the public sector? In the following sections we will also examine possible outcomes of EDI implementation in public sector organizations.

2.2.1 Introduction to the employee-driven innovation

The section will introduce a reader with the concept of employee-driven innovation based on current theoretical and practical investigations in this field. The aim of the literature review is to make overall presentation of EDI conception and its definition, used throughout the master thesis.

The duty to make decision concerning innovation generally lies in the hands of senior management. The development of innovation in the company is usually limited to the work of R&D department, excluding ordinary employees to participate in the innovation process (Kesting & Ulhøi, 2008; Teglberg-Lefevre, 2010). In the modern innovation-oriented world it seems illogical to focus only on R&D programs and limit the development of innovation to a few people (Aho, 2005). Involvement of employees to innovation process is the potential driver of innovation performance for an organization, because they can contribute a lot with their creativity, specific knowledge, awareness of operational processes and close contact with customers (Kesting & Ulhøi, 2008).

According to Kesting and Ulhøi (2008) employee-driven innovation concept assumes scooping the ideas, knowledge and creativity from employees, e.g. from the bottom-up, and involves the application of these ideas into practice. It is important to notice that employee-driven innovation can be studied from different positions. For example, this phenomenon can be investigated from position of personality characteristics (Hurt et al., 1997) or from behavioural perspectives (Janssen, 2000; Jong & Hartog, 2007).

Employees' involvement in the innovation process starts with ideas generation (Teglberg-Lefèvre, 2010). The creation of innovation ideas requires creativity from employee. Sufficient amount of research were conducted on the subject of creativity (Scott, 1995; Amabile et al., 1996; Mumford, 2000; Andriopoulos, 2001; Nijhof et al., 2002; McAdam & McClelland, 2002; Zhou, 2003; Shalley & Gilson, 2004; Gumusluoglu & Ilsev, 2009). But mistakenly to believe that innovation is simply the production of new ideas. Amabile et al. (1996) in his research on creativity has distinguished between the notion of creativity and innovation. Kesting and Ulhøi (2008) supported his definitions and stated that creativity is the formation of new and useful ideas in any field, while innovation represents the successful realization of these ideas in an organization. In general the notion of innovation implies the process from idea generation to its realization in form of innovation. Many theorists and practitioners also divided this process into two stages: the first stage is idea creation and the second - is idea

implementation. Nevertheless, most of investigations focus only on the first stage (Amabile et al., 1996; Mumford, 2000; McAdam & McClelland, 2002). Both stages of employee-driven innovation were found in the works of Zaltman et al., (1973); Axtell et al., (2000); Janssen (2000), Jong & Hartog (2007), and Kesting & Ulhøi (2008).

The title “employee-driven innovation” may vary in the literature. Some researchers tend to use the term “employee’s innovative behaviour” or “bottom-up innovation”. Under the innovative behaviour it assumed actions from initiation to implementation of new, useful ideas *through which employees can contribute to the innovation process* (Jong & Hartog, 2007:43). Bottom-up innovation, according to Borins (2002) is innovation, which emerge from workers, scientist, middle-managers, or other staff. All these terms mean more or less the same. The difference mainly lies in the approach to the concept. One or other approach depends on the research objectives and vision of the investigator. For example, Jong and Hartog (2007) focused on the research of leaders, how they can stimulate and enhance employees’ innovative behaviour, while Kesting and Ulhøi (2008) revealed which drivers affect employee-driven innovation. Borins (2002) in his study researched the relationship between leadership and innovation in the public sector, considering bottom-up innovation. In our work we take into consideration the factors influencing employee-driven innovation and address them in the public sector. Each factor will be considered in detail further in the sections.

As Jong & Hartog (2007) mentioned, an integral part of employees’ participation is their willingness and ability to innovate. Nowadays more and more employees need to fulfil their potential at work. They are willing to use their skills in order to make a contribution into organization development, even if it is not their duty. After technological progress the role of employees was changed. Increasingly physical labour is replaced by automatic, machine processes. Now employees are not *low-skilled mechanical workers* anymore (Kesting & Ulhøi, 2010: 65). They want to be interested in the job which they do, to be involved into the process, and to be a part of a company. At this point, job satisfaction comes to forefront.

Organizations which utilize employee’s potential are more competitive and innovative in the market. The strength of human resources is often underestimated. The notion of human capital refers to knowledge and skills of individuals, *that allow for changes in action and economic growth* (Dakhli & Clercq, 2004:108) and covers all employees, who work in an organization, including top managers, middle-managers and ordinary employees (Kesting &

Ulhøi, 2010). Human capital is a powerful and important long-term organizational resource and certainly it should be used in innovation development of any organization. Confirming to the foregoing, Dakhli and Clercq (2004) examined the effect of human capital on innovation and found strong positive relationship between them. Teixeira and Fortuna (2004) also confirmed that human capital influences innovation and furthermore, found out the indirect effect of human capital through innovation on economic growth.

All in all, this section provided introduction to the concept of employee-driven innovation. Summing up the definitions of EDI from different authors (Borins, 2002; Jong & Hartog, 2007; Kesting & Ulhøi, 2008), we defined employee-driven innovation as innovation arising from the involvement of employees, implying scooping the ideas, knowledge and creativity from staff, and involving the application of these ideas into practice. The process of EDI presumes two stages: idea generation and its implementation. Both of them will be considered in the work. The terms “employee-driven innovation”, “employee’s innovative behaviour” and “bottom-up innovation” are assumed to be interchangeable throughout the master thesis.

2.2.2 Employee participation in innovation process

Why is innovation idea generated from employees in some cases can be more significant than innovation ideas generated from superiors? Here important to note that through communication between employee and manager, innovation idea can be useful and most likely successful. Employee participation to the innovation process and decision making is the main ingredient of successfulness of manager’s decisions. First of all, employees have closer contact with a specific of their work. For example, if it is the service industries, employees have a regular contact with customer. They are more aware of customer preferences and needs than managers who have only indirect contact with customers. The same is with industrial sector, where employees, such as engineers and technical staff, have the specific and deep technical knowledge about equipment and processes taking place at the factory. Managers, in turn, have quite limited knowledge about what actually happen at the front-line employee’s workplace. They can gather information indirectly, e.g. through feedback from employees (Feldman, 2003). However they are responsible for decision making. To make an informed decision managers need information about organization’s strategy, organization’s activities and organization’s environment (Kesting & Ulhøi, 2010). The problem is that managers have only some sort of the information. They do not know everything what happen in the organization, especially if it comes at the operational level. There is also a communicational

problem with, for example, technical employees, because managers often don't have time to understand a specific process in every detail. Thus, managers have a lack of information from both external (customers, suppliers, etc.) and internal (workers) sides. This supposes that managers have limited information, especially at the operational level. Management needs support from others departments such as R&D, marketing department, also from external stakeholders such as consultants, partners (Donaldson and Preston, 1995) and of course from ordinary employees in order to make a good informed decision. Therefore, we may conclude that the key function of employee participation at the all levels *is to minimize the imperfections of management decisions* (Kesting & Ulhøi, 2010:69).

2.2.3 Opportunities and limitations of employee participation

Employee participation to innovation process is favourable from either side: to managers – it provides additional information about overall picture; to employees themselves – it increases job satisfaction and self-realization; to an organization – it develops a good innovation decision, which leads the company to success (Kesting & Ulhøi, 2010). However, there are at least two obstacles to employee involvement, which related with 1) manager's fear to lose control and be less powerful, and 2) employee's desire to be involved. The main responsibility of management is to make good decisions, based on information and resources that they have. When managers apply the decision to the practice they expect that it should work properly and employees must comply with the order of manager. For managers it would be a guarantee of prestige and power. Managers are afraid to delegate their responsibilities and share information with other employees, because they fear to weaken their position in a company.

In turn, not all employees are willing to participate in innovation process, use their leisure time, especially when it is not a part of their job. And sometimes employees simply do not have enough skills and knowledge in order to support innovation process (Kesting & Ulhøi, 2010). Thus, it is necessary for managers to distinguish such employees and split them from those who have a desire to innovate.

2.2.4 Structures of innovation decision-making

Kesting & Ulhøi (2010) outlined the traditional type of innovation decision making in organization as it shown in Figure 2 and the type with EDI implementation (see Figure 3). First of all, we should point out, that there are two main actors in the organization: managers

and employees. The traditional structure of making innovation decision (see Figure 2) supposes that managers have the responsibility to create innovation ideas and to make decisions on it. However, the decisions tend to be not perfect. Managers just appoint the way and frame of new routine, without going in every detail.

Under “routine” we assume already known resolutions of existing problems (Kesting, 2007). Nelsen and Winter (1982) mentioned that working process in organization is strongly routinized. This means that environment is more or less stable and working activities are repeated day by day. Thus, development of management routines reduces manager’s effort to planning. Still one successful solution was routinized it does not demand management attention anymore (Cohendet & Llerena, 2003). Therefore, firm can redirect management attention to make strategic and innovative decisions.

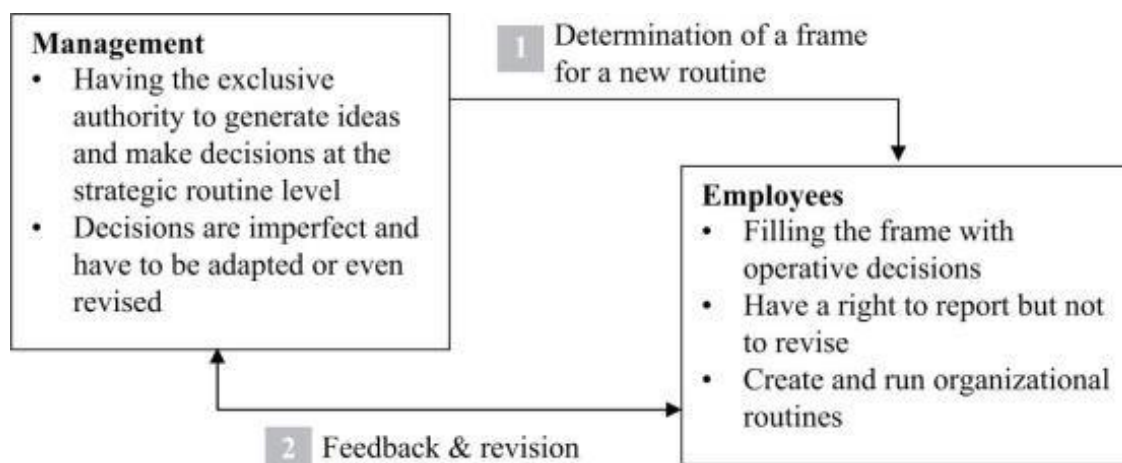


Figure 2. Ideal type organizational structure of traditional innovation decisions (Kesting & Ulhøi, 2010:72)

Employees in response to manager’s action have to implement and run this new routine. Their responsibility is to provide critical feedback to managers about how successful were implemented their solutions, but they cannot change or correct given decision. However, employees have a duty to adapt manager’s decision, but every time they have to negotiate all details with management.

In order to move to a new routine, organization requires radical kind of innovation (Nelson and Winter, 1982). Only radical change can turn organizational routine in a new path.

Moreover, radical innovations are rather employee-driven than market-demanded. If managers would rely on user-driven approach to innovation, they most likely will develop incremental innovations.

When organization involves employees in innovation decision-making, which starts from idea generation and continues by participation to decision-making process, employees are allowed temporary to control decisions related to innovations and to make a proposal about changing or improvements of existing routines (see Figure 3).

Managers, in turn, still have an authority to make a final decision. However, a manager may temporary delegate his decision authority to employee or group of employees. Now there is open a joint perspective for managers to determine the frame of a new routine in collaboration with employees. The final stage of innovation decision making is to provide a feedback – for employees; and for managers- is to revise possible shortcomings.

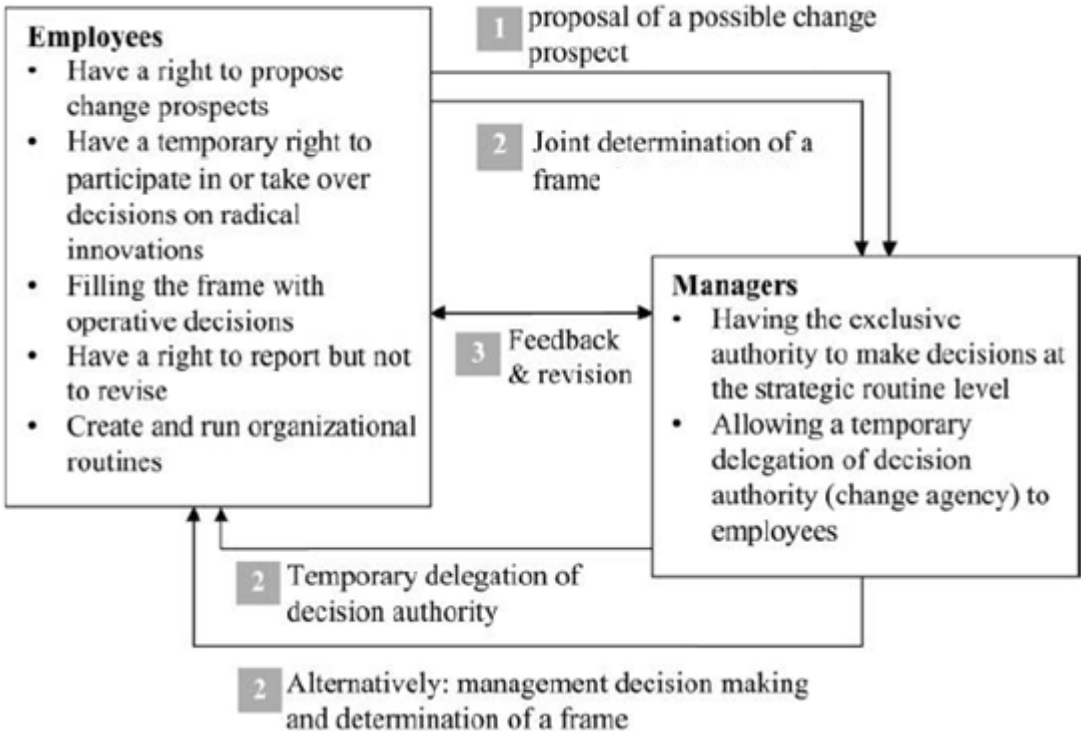


Figure 3. Ideal type organizational structure of an employee-driven innovation (Kesting & Ulhøi, 2010:75)

2.3 The concept of employee-driven innovation within the public sector

Since most of the studies on employee participation to innovation are investigated within the private sector, the purpose of current master thesis is to study the influence of employee-

driven innovation on the innovation effect in the public sector. As was mentioned before, public sector innovation combines the general definition of innovation with type of innovation in the public sector such as process, product, communication and organizational innovations. The definition implies a significant change compared to present practices (Bloch, 2011). This definition is also used in the latest research on innovation in the public sector, such as MEPIN and Innobarometer. The common goals for public sector innovation are to increase efficiency and transparency, improvement of user satisfaction and quality of provide services (Petkovšek & Setnikar Cankar, 2013).

In general, there are only few researches on the topic how public sector innovation occurs. Mostly researches were based on small-scale survey or case study (Arundel & Hollanders, 2011). The largest survey at that time (up until 2 000s) was made by Borins (2001). He questioned 300 organizations from the public sector, located in the United States and some other Commonwealth countries. Thereafter, in 2010 only three surveys on innovation in the public sector were conducted. There are the NESTA pilot survey, the MEPIN survey and Innobarometer. The NESTA survey was launched in the UK health and local government organizations and collected 175 responses (Hughes et al, 2011). The MEPIN survey was conducted in Nordic countries: in Finland, Sweden, Denmark and Norway among public organizations. The Oslo Manual guidelines (2005) for estimating innovation effect in the private sector were adapted for the public sector and underlying questionnaire of the MEPIN project. Within the MEPIN project 2 012 public agencies were surveyed. However, the type of public organization varied in every country (Bugge et al, 2011).

The largest research on innovations in the public sector is Innobarometer survey (Arundel & Hollanders, 2011). The survey was developed collaboratively between MERIT, Gallup group and the European Commission and conducted in Norway, Switzerland and in the 27 EU Member States (European Commission, 2011). All in all, the Innobarometer comprises 3 699 responses from public agencies and it is the data source for current investigation.

The employee-driven innovation approach is quite new for public organizations. It refers to the theory of human capital. Mirela (2013) in his research identified that human resources is one of the innovation indicator in both the private and the public sector. This indicator is considered as important component of innovation and its importance increases over time through the studies since Innobarometer 2001- Innobarometer 2010 (Mirela, 2013). The aim of applying this approach in the public sector is to make the public sector more innovative in

order to increase its efficiency, improve user satisfaction and quality of provided services (Petkovšek & Setnikar Cankar, 2013). Likewise it could also be beneficial for employees by providing better work conditions and fascinating job activities, as an example. This goal establishes a conducive condition for organization and employees to support and foster innovations. The increasing number of innovative public organizations is future trend in the EU27 (Mirela, 2013).

Despite this, employee-driven innovation concept is very little explored regarding to the public sector. The study of Borins (2002) investigates leadership and innovation in the public sector. He considered top-down and bottom-up innovation and argued that there is a strong relationship between leadership and innovation in the public sector. The results showed that innovation from bottom-up occurs more frequently in public organizations due to employees who act as informal leaders when initiating and conducting innovation (Borins, 2002). His research was a starting point for the current investigation, since he discovered that innovation in the public sector mostly appears from bottom-up. We found it very interesting to investigate employees as a source of information for public sector innovations. Arundel & Hollanders (2011) support our assumption that one of the main strategies leading to innovation in the public sector is bottom-up. They investigated how EU public agencies innovate and found that more than 34% of public organizations use this approach. Moreover the effect of using particular strategy on outcomes was estimated. The usage of bottom-up strategy showed significant high outcomes.

Therefore, the first hypothesis postulated as: the ideas from employees as a source of information positively influence innovation effect in the public sector (see Figure 4).

***Hypothesis 1:** Ideas from employees as a source of information positively influence innovation effect in the public sector.*



Figure 4. Hypothesis 1

2.3.1 Factors influencing on employee-driven innovation

There are different factors influencing on the innovation ideas from employees. In order to indicate them we should think first about what primarily affects employees. Every employee has a certain knowledge base when he or she comes to the company. This knowledge base forms human capital, which is often “hidden treasure” for many organizations. It is hidden, because human capital is quite broad notion and it is hard to utilize employees’ abilities and potential (Kesting and Ulhøi, 2008).

Kesting and Ulhøi (2010) considered employee participation in innovation. The purpose of their research was to establish “grand structure” of employee-driven innovation (EDI) in order to identify driving forces and underlying processes of EDI. According to this goal they identified five drivers that foster employee-driven innovation, such as incentives; management support; favourable environment; decision structure; corporate culture and climate (see Figure 5).

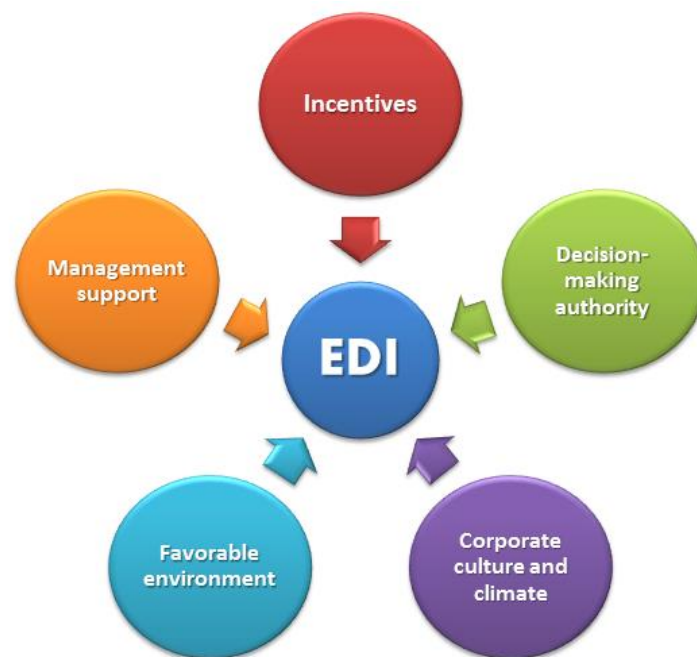


Figure 5. EDI model

Employee-driven innovation is examined as a core. The five forces around directly affect this phenomenon and encourage the employees to innovate. General EDI driving forces may well be applied to public sector organizations, albeit with some refinements, because the EDI phenomenon possesses similar features in both sectors.

Since any innovation it is two stages process starting from idea generation and then its implementation, each employee-driven innovation requires some sort of motivation and skills for generation ideas, and then certain conditions and support for further implementation and realization of the ideas. The researches considering the first stage (McAdam & McClelland, 2002, Mumford, 2000) revealed that the idea generation process associated with motivation and skills, both relevant and creativity skills. Moreover you may often find in the literature that creativity equated with idea creation (McAdam & McClelland, 2002). With this regard, in our research we also divided employee-driven innovation into two stages and each of the stage will be considered separately. This section will reveal factors which influence on ideas generation from employees.

Incentives

As was found in the research (McAdam & McClelland, 2002; Mumford, 2000; Kesting and Ulhøi, 2010) incentives have a direct influence on EDI (see Figure 5). Generally companies provide some reward in order to motivate their employees. Creation innovation is not a simple process of coming with a new idea and put it in a big box, then waiting when organization would implement it. Innovation requires a group of people, confederates, who support and share your idea. To encourage innovation ideas among employees, reward system should be oriented on the group of people, who generated these ideas and not on the individuals. Due to high percent of innovation failure, there is still remaining an open question whether or not organization should reward initiative which subsequently fails (Kesting & Ulhøi, 2010). However, rewarding is one of the possible incentives. Employees, such as front-line workers and middle managers are the main contributors in bottom-up innovation process and therefore they temporary have a leadership role, during the project. Main incentive for employees in this case is fast career growth towards senior managers (Borins, 2002).

Halvorsen et al. (2005) investigated the differences between innovation in the private and the public sector. He found that the main mismatch lies in incentives and motivation. It originates from the different organizational goals from both sectors. Public sector organizations do not competing for profit maximization, therefore it is expected that they have less incentives to innovate than private organizations.

In Publin report (2005) motives, which influence on individual's innovations in both public and private sectors, were identified and compared. It is obvious that the private sector have

wider range of incentives for innovation behaviour of employees, than the public. However, there are a lot of common incentives between both sectors as well (see Table 1).

Such incentives as prestige, self-realization, career growth, power, etc. were found in both sectors. As for money incentive, the public sector is very limited in terms of rewards and bonuses. In contrast to private sector, the public sector has no financial incentives for innovation so innovators often do not get any adequate reward (Golubeva & Sokolova, 2009). Nevertheless, public employees are motivated by contribution in a society. From Publin research was found that idealism and contribution to better society is a key driver for innovations in the public sector (Koch & Hauknes, 2005).

Table 1. Possible innovation incentives in the private and public sector (Halvorsen et al., 2005:14)

Incentives for innovation in the public sector /Individuals	Incentives for innovation in the private sector /Individuals
<ul style="list-style-type: none"> ○ Prestige ○ Self-fulfilment ○ Professional recognition ○ Potential for spin-off business ○ Idealism ○ Career ○ Power ○ Money (salary) 	<ul style="list-style-type: none"> ○ Prestige ○ Self-fulfilment ○ Idealism ○ Career ○ Power ○ Money (salary, profits, bonuses) ○ Job security via enhanced company competitiveness and profitability ○ Imposed requirement

In our work we want to consider the influence of incentives on employees' innovation ideas. In this connection, the second hypothesis is formulated: Incentives for employees increase importance of their ideas for innovation development.

Hypothesis 2: *Incentives for employees increase importance of their ideas for innovation development.*

Workforce skills

Every organization has certain set of resources to create innovations. Resources comprise employees, skills, experience, knowledge, finance etc. Human capital is particularly important for the public sector, because workforce skills are considered as key driver for innovations (Thenint, 2010). McAdam & McClelland (2002) and Mumford (2000) have already pointed out in their studies that essential innovation ideas comes from the employees' skills. In order to develop good and creative workforce skills employees require constantly training, through

which they will get experience and extend their knowledge. It is logical, that if you contribute to human capital and develop employees' potential the idea from employees would most likely be successful. Therefore, organization will not fail these innovations and the importance of employee's idea will increase.

In the literature it is written that workforce skills have an influence both on idea generation and idea implementation (McAdam & McClelland, 2002). It is not enough to provide training concerning only idea realization phase. The initial step is to stimulate innovative ideas in order to create ground for further implementation. Since it is so, the third hypothesis is postulated: Workforce skills positively influence importance of employees' ideas for innovation development.

***Hypothesis 3:** Workforce skills positively influence importance of employees' ideas for innovation development.*

Education

Employees with high education much more likely will generate good innovation ideas, than without it. However, from the other side, more creative and "crazy" ideas come from less educated people (Kesting & Ulhøi, 2010). It is so, because they do not have this schoolroom information, which limited innovation thinking. The higher the education the more deeply people understand the nuances of working tasks. That is actually good, because person should be aware of how a particular process works in order to find a new solution to solve it. The problems usually are solved based on scientific and theoretical knowledge from university. And this regime oppressed creative thinking of employees (De Simone, 1968). Once, Kettering said "An inventor is simply a fellow who does not take his education too seriously" (De Simone, 1998:83). Marshall McLuhan supported his idea by statement, that schools distract students from education. As he claimed the outside world is richer in information, knowledge and experience than is the classroom. Based on expertise of "outside" world relevant of the study person can come up with new ideas how to change something. The changes can be both for "better" or "worse". And it is normal for innovator to fail. Generally innovators fail all the time and only in rare cases they manage to achieve success (De Simone, 1968).

Education plays an important role for both employees and employers. Well educated employees should develop a company. But workers without higher education cannot be

discounted. They can contribute to a company success by their creativity and extraordinary solutions. Innovation ideas come from employees without high education could be very significant, because they less prone to patterns' thinking based on science. However, the ideas have to be controlled by well-educated employees in order to develop these ideas in proper direction.

In the study we concerned in the relationship between education and importance of employees' innovation ideas and want to check whether or not there is a positive influence between these two variables.

***Hypothesis 4:** Education positively influences importance of employees' ideas for innovation development.*

2.3.2 Factors influencing innovation ideas from employees and innovation effect in the public sector.

Management support

Management support is essential part of the employee-driven innovation concept. Kesting and Ulhøi, 2010 and Borins (2006) identified it as one of the driver of employee participation to innovation (see Figure 5). This driver was examined as a self-contained topic about supportiveness of employee's innovation behaviour by many researchers (Jong & Hartog, 2007; Janssen, 2005; Amabile, et al. 2004; Shalley and Gilson 2004; Basadur, 2004) and has been isolated as a most influential factor for employee's motivation to innovate (Howell & Avolio, 1993; Mumford et al., 2002).

Generally, management support is a necessary ingredient of any employee participation. Employees are dependent on their managers in terms of information, resources and supportiveness almost in every organization. In order to develop innovative ideas, employees need the support. Otherwise, they can "lose face" in taking part in innovation process (Amabile et al., 2004; Clegg et al., 2002).

Kesting and Ulhøi (2010) indicated that management support concerns two things. First, refers to decision strategy, the authority to make a decision usually belongs to managers. In this case, management support should provide some kind of "licence" to employees allowing them to use some working time and resources in order to participate to innovation projects, i.e. allow them to make step out of their defined role. Second, managers can play the role of

mentor, supporting employees during the whole innovation process, starting from the idea-generation and its implementation (Kesting and Ulhøi, 2010). The most common use of management support is within the second context (Howell & Avolio, 1993; Mumford et al., 2002). Without this type of management support employees will rarely take the initiative to participate in innovation (Amabile et al., 2004). Therefore, the task for managers is to support the idea from employee and to help to transform this idea to innovation.

Nevertheless, the variety of management support forms has not yet been systematically investigated. Due to this, the fifth hypothesis states that ideas from employees are expected to mediate the effect of management support on positive effects of innovations.

Hypothesis 5: *Management support is expected to affect the size of positive effects of innovations through its effect on ideas from employees.*

Top-down decision making strategy

The public sector generally tends to be influenced by political decisions. Basically, public sector organisations controlled by government. Funding of the public sector organisation strongly depends on current politicians and their decisions. Therefore, there is a conventional wisdom that whatever public sector innovation occurs comes solely from the top (see Figure 5) (Wilson, 1989). Thereby, public sector organizations characterized as conservative and stable in order to avoid risk.

In the public sector top leaders are represented by ministers, secretaries, senior servants or other politicians. They have the authority to make decisions on upper level and usually their way to management the public sector is strictly hierarchical (Borins, 2002). Since it is so, political and legislative factors become important when it comes to innovation in the public sector. Borins (2002) studied the relationship between leadership and innovations in the public sector, considering bottom-up ideas as well. He pointed out, that in cases when public administration, as for example Republican administrations in America, unsympathetic to the mandates of some departments (e.g. Department of Labor and the Environmental Protection agency) and want this department to do as little as possible, this department would definitely not develop new programs, even if there is initiatives to improve efficiency of the department (Borins, 2002:470). This unsympathetic mood can appear and suppress innovation if the goals of politicians and department are different.

However, innovations in the public sector provide opportunities and benefits for politicians *to take public credit* for implementation effective programs and wise policies (Borins, 2002:472). In order to introduce new programs and increase efficiency of the public services, politicians should support employees who come forward with ideas how to do it. Decisions on the top level can open the door for innovation in the public sector as well as close it. Therefore, political and legislative factors should be released wisely.

In this connection, the sixth hypothesis is formulated as follow: Top-down decision strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees.

Hypothesis 6: *Top-down decision strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees.*

Favourable environment

Next driver of EDI is a favourable environment (see Figure 5). A favourable environment can be assessed in many ways, including material and nonmaterial aspects. In order to encourage employees on innovation, organizations should have necessary infrastructure and provide facilities for their employees. Creation of favourable environment may include involvement of private firms, which can provide consultants and trainings for public sector or provide the necessary technology for employees. It is also related to a feeling of security and actually important when employees assume responsibility for change and innovation. At the same time, a favourable environment is concerned with work life traditions and marked conditions that may influence whether, and how, employees are involved in innovation (Amundsen et al, 2014). In order to force employees innovate in a continuous, sustainable and a long-term way it is not enough just resources and technical support but working environment with culturally embedded understanding and appreciation of innovation with such treats as nimble, responsive, exploratory and creative (Shah, 2011).

Zhou (1998) and Perry-Smith at al. (2003) showed that employees need information, resources and time for innovation. Organization should provide conditions for employee's inspiration and communication. Besides that, employees need to have a specific knowledge to be able to innovate and avoid blunders. It can be realized through collective meeting, discussions and/or training programs. However, in contrary, these activities are time consuming and costly. They distract employees from major job responsibilities.

According to this background, the seventh hypothesis is formulated: Environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees.

***Hypothesis 7:** Environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees.*

Barriers

In the literature barriers to innovation particularly in the public sector have attracted attention of a number researcher, most likely due to different obstacles between the public and private sectors (Arundel & Hollanders, 2011). Such barriers as limited financial resources, risk-averse culture, regulatory requirements, lack of support and staff resistance were found in the works of many researchers (Thenint 2010; Mulgan & Albury 2003; Borins 2006; Koch & Hauknes 2005; Bloch 2011; European Commission 2011).

Halvorsen et al. (2005) argue that internal barriers to innovation such as management support, staff resistance or risk-averse culture are barriers for government effectiveness in general. As the most important barriers they highlight lack of human or financial resources, regulatory requirements and lack of management support and incentives for staff.

According Bugge et al. (2011) depending on the public sector definition, on top-down or bottom-up initiatives there can be many different barriers to innovation. In their study they found out that political and internal barriers are the most important. Lack of flexibility in laws, lack of incentives or lack of funding, inadequate time or lack of incentives are examples of these barriers. Also as less important ones they mentioned organizational and external barriers.

Golubeva and Sokolova (2009) give the main ideas of obstacles in the way of innovations in the public sector. In contrast to private sector, the public sector has no financial incentives for innovation so innovators often do not get any adequate reward. As the previous authors they mention risk-averse culture in which decisions are taken driven by risk aversion and not by risk premiums. An excessive amount of formal rules and procedures and high barriers between departments, organizations, etc. are also can be strong barriers. Thus, barriers prevent the spread of knowledge (Golubeva & Sokolova, 2009).

Mulgan & Albury (2003) identified that two more important obstacles, which could hinder innovation in the public sector are risk-aversion and staff resistance.

The willingness to take on risk is an important issue for public sector innovation (Bloch 2011). The public sector is often regarded as risk-averse and is less willing to take risks than the private sector (Koch & Hauknes 2005:20). Furthermore, MacPherson (2001:2) suggests the main problem to public sector innovation is the “public sector attitude which is often unsympathetic and naturally critical” and goes on to declare that in a political environment “the costs of failure tend to be much higher than the benefits of success.” This is why Hartley (2005) argues that most political leaders and managers are unlikely to support innovative ideas, which results in a risk-averse culture and non-innovating public sector. Furthermore as Borins (2001: 311) points out, the “consequences for unsuccessful innovation are grave”, because a mistake is likely to be utilized by opposition parties and media. From there, the career of the person, who was responsible for the unsuccessful innovation, is doomed to failure (Borins 2001; Joyce 2007; Moore 2005). Therefore, this less willing to take risk could hinder public sector innovation.

To sum up all barriers eighth hypothesis states: Barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees.

***Hypothesis 8:** Barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees.*

3. Research model

The research question to the investigation was formulated as follow: *How ideas from employees influence the innovative effect in the public sector and what factors affect employee-driven innovation and innovation effect in public sector organizations?*

Based on the overall research question, theoretical insight and developed hypotheses, the following research model of employee-driven innovation and innovation effect in the public sector is presented in Figure 6

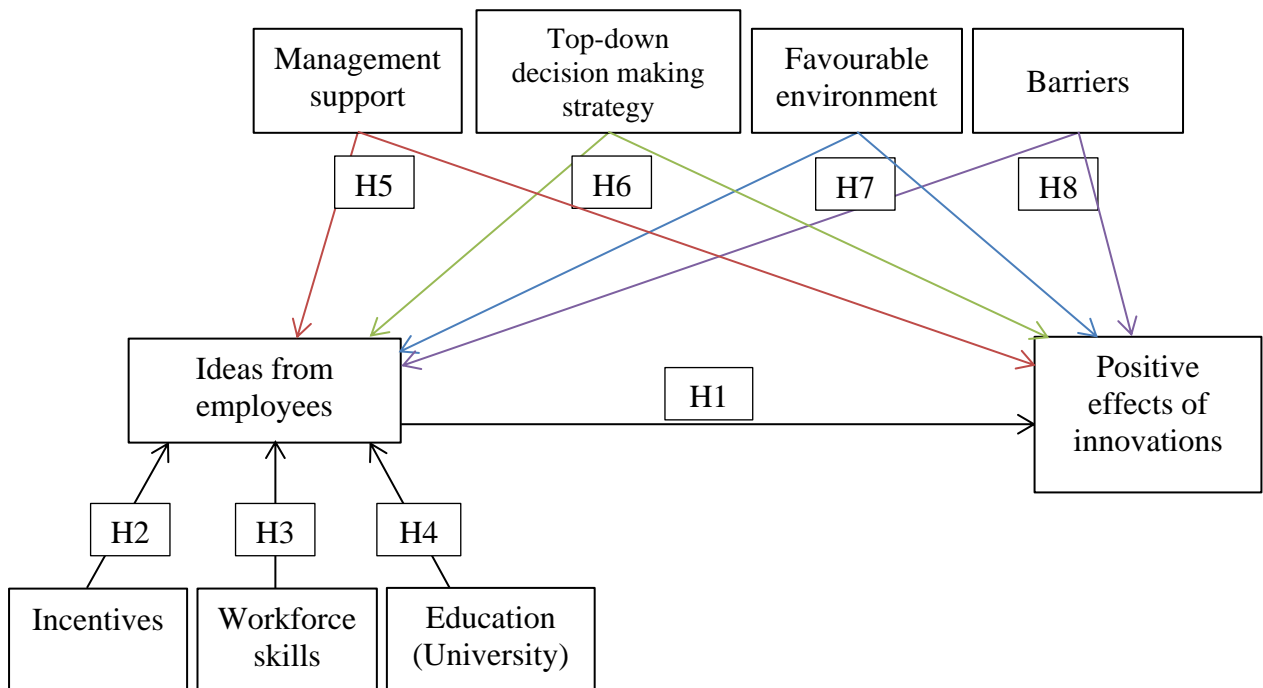


Figure 6. Research model of employee-driven innovation and innovation effect in the public sector

The research model examines ideas from employees as a source of information for innovation development of an organization and suggests that innovation, developed from employees' ideas refers to the employee-driven innovation concept. Innovation effect represents the sum of positive effects of the introduction new or significantly improved services, process or methods.

One of the purposes of this model is to ascertain relationship between ideas from employees and the innovation effect. Another purpose related to identifying the factors that affect the formation of employees' ideas and which reflected in the innovation effect. In other words,

the goal is to reveal the factors affecting employee-driven innovation and subsequent innovation effect in public sector. The factors derived from the theory are: incentives, workforce skills, education, management support, top-down decision strategy, favourable environment and barriers. We suppose that three of them (incentives, workforce skills and education) solely affect employee's idea generation and other four (management support, top-down decision strategy, favourable environment and barriers) influence the innovation effect both indirectly, through affecting ideas from employees and also have a direct impact on employee's ideas and innovation effect apart.

The following eight hypotheses have been derived from the theory in order to investigate the relationships between variables.

Hypothesis 1: *Ideas from employees as a source of information positively influence on public sector innovation.* It means that the higher the importance of employees' ideas as sources of information for innovation development, the more positive innovation effect will be in an organization.

Hypothesis 2: *Incentives for employees increase importance of their ideas for innovation development.* It means that when employees have incentives to think of new ideas and take part in their development, they become more important as sources of information for innovation.

Hypothesis 3: *Workforce skills positively influence importance of employees' ideas for innovation development.* It means that more skilled employees are more important as sources of information for innovation.

Hypothesis 4: *Education positively influences importance of employees' ideas for innovation development.* It means that increase in amount of employees with university degree will lead to higher importance of employees' ideas for innovation development.

Hypothesis 5: *Management support is expected to affect the size of positive effects of innovations through its effect on ideas from employees.* In other words, ideas from employees are expected to mediate the effect of management support on positive effects of innovations.

Hypothesis 6: *Top-down decision making strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees.* In other words, ideas from employees are expected to mediate the effect of top-down decision strategy on positive effects of innovations.

Hypothesis 7: *Environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees.* In other words, ideas from employees are expected to mediate the effect of environment on positive effects of innovations.

Hypothesis 8: *Barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees.* In other words, ideas from employees are expected to mediate the effect of barriers on positive effects of innovations.

Quantitative method was chosen for analysing the research model. Such techniques as factor analysis, correlations and OLS regressions and mediation analysis will be applied. The following methodology chapter describes them in more details.

4. Methodology

The methodology chapter of the master thesis will reveal the chosen methods to study, data collection and unit of analysis. Furthermore the chapter will help the reader to understand the philosophical aspects of the paper and determine techniques in which analysis will be employed in order to answer the given research question. The notions of validity and reliability of the research will be also discussed.

4.1 Philosophical concept of the research design

There are ongoing debates among social science researchers concerning ontology and epistemology. The main debatable positions within ontology according to Easterby-Smith et al. (2012) are internal realism, relativism and nominalism, while the central debate within epistemology indicates two contrasting ways of conducting research such as positivism and social constructionism.

For any investigator it is particularly important to decide on methods which should be applied for collecting and analysing data. The choice usually depends on the philosophical position of the researcher. Philosophical assumptions help to clarify further research design in order to get good answers for an investigation. Not any design will fit the purpose of a research. Knowledge of philosophy will enable the researcher to develop a good research design, using correct methods and techniques for data collection and analysis, and avoid designs that will not work in a particular investigation. Moreover, awareness of philosophical assumptions will help to identify the limitations of chosen methods (Easterby-Smith et al., 2012). This sub

section will give an idea of the philosophical position underlying the chosen method and research design of this thesis.

As was mentioned before, for any researcher the initial step is to choose the methods according to which data will be collected and analysed. This choice mainly depends on the approach to the study whether it is quantitative or qualitative analysis. In some cases it is more appropriate to employ quantitative methods rather qualitative and vice versa. However, both of them have some advantages and disadvantages, which are broadly covered in the literature (Easterby-Smith et al., 2012). Taking into account that we use existing data collection from Innobarometer survey 2010, the quantitative analysis will be employed in the current master thesis.

The data gathered from research and its interpretation will highly depend on chosen philosophical perspective. Therefore it is particularly important for researcher to determine approach to the investigation and philosophical concepts from the beginning.

Quantitative analysis refers to realist ontologies which comprise realism and internal realism. Following a link between ontology and epistemology, which good represented in management research book (Easterby-Smith et al., 2012:25), positivistic epistemology is fitting with realist ontologies.

In the master thesis we are guided by position of internal realism in terms of ontology and using positivism from epistemological perspective. The choice of the research strategy was made on the reverse side: we based on large scale survey and operated mainly by numbers, using correlation and regression for analysis. Thus, philosophical position such as internal realism with positivism ways of inquiring knowledge fits better for our research.

According to Babbie (2010), the study of social science has three main purposes: exploratory, descriptive and explanatory. Exploratory kind of research is characterized by familiarization reader with a topic. For descriptive studies the purpose is to describe an event or situation and researcher usually observes first and then describes this. The explanatory purpose of a research used to explaining things (Babbie, 2010).

This research utilizes explanatory approach to employee-driven innovation in the public sector in general, because the aim of this study is to understand whether ideas from employees have positive innovation effects in the public sector and explain which factors foster these

innovations. However, in some sense the research may refer to exploratory kind, since we introduced employee-driven innovation concept in the new field such as the public sector. This approach of innovation is already known and popular in the literature, however, the application of this approach into the practice was explored mostly in the private sector. For the public sector this concept is quite new and, therefore, it needs to be described and discussed in more detail.

Scientific research comprises two approaches to theory construction, deductive and inductive (Blumberg et al. 2008). Deductive approach uses some general expected pattern from the theory first and then moves to observations. While inductive approach begins from certain observations and then goes to theory development Babbie (2010). The current study applied deductive method, since we started our research from general theoretical frameworks and hypothesised some statements, and then moved to concrete observations with regard to initial theory. Deductive approach gives general, less biased, objective and value-free results (Blumberg et al. 2008). This method belongs to positivist epistemology and comprises large samples. Large samples are commonly used in quantitative analysis (Easterby-Smith et al., 2012).

4.2 Research design

As it was mentioned above, epistemology of current study tends to positivism. According to Easterby-Smith et al. (2012), such design as surveys is dominated in positivist epistemology. Since the aim of the current study is to establish relationships between variables, which have been detected from the theory, certain type of survey should be chosen. Inferential survey is characterized by determining relationships between dependent and independent (predictor) variables and it meets the objectives of our study. Using inferential survey, the researcher has to isolate the appearing factors, which are involved in some concept and to identify what causes those factors i.e. to distinguish what are the dependent and independent variables of the investigation (Easterby-Smith et al., 2012).

In the master thesis specific factors such as ideas from employees, innovation effect, incentives, workforce skills, education, management support, top-down decision making strategy, favourable environment and barriers were determined from the theory, which have potential influence on the dependent variables named the “ideas from employees” and the “innovation effect”. The latter dependent variable is obtained by summing all the positive effects of innovation. All in all the research paper investigates the model, which comprises

two dependent variables (one of them is also a mediator) and seven independent. Thus, inferential kind of survey will be a good choice for the designing of the research.

Moreover, inferential survey usually comes from internal realism ontology and assumes a weaker form of positivism (Easterby-Smith et al., 2012). Thereby, presented research design is perfectly fitted for our investigation.

4.3 Unit of analysis

Identifying the unit of analysis is a common dilemma when developing research design. In order to decide on the unit of analysis one need to look what forms a sample. The aim of investigation is to know more about employee-driven innovation in the public sector. Research on such kind of topics as “corporate entrepreneurship”, “intrapreneurship” and other similar topics with the focus on employee-driven innovation, mainly chooses organization as the unit of analysis. However, some investigations, which willing to know more about bottom-up innovation and go even deeper to know employees’ perception on this matter, use the individuals as a unit of analysis (Åmo, 2005).

In our case sample consists of organizations from public sector. For us it is important to understand which factors influence on employee-driven innovation and on innovation effect in a particular sector, which is the public sector. Therefore, the unit of analysis, which forms the basis for our sample, is public sector organization.

4.4 Sampling and data collection

As it was outlined before, quantitative methods will be used in the current investigation. The source of data collection and subsequent analysis is existing and available survey (Innobarometer 2010). Therefore, this master thesis will be built on the secondary data, which is open on the official website (http://ec.europa.eu/index_en.htm) and published in forms of report (Innobarometer 2010). Secondary data is data which already exists (Cowton, 1998). Usually, this data is collected for other purpose in response to different research question. Any sort of primary data may be used as a source of secondary data (Hox & Boijie, 2005). Using secondary data gathered by other people is quite common in business and management research (Babbie, 2010). It provides such advantages as lower costs and greater speed of conducting research. Moreover, in some cases the use of secondary data source may overcome the difficulties in the collecting of primary data (Cowton, 1998). From one side it is valuable to work with existing statistics, however researcher should be careful when choose

collection of the data and retrieve it. The first thing the researcher should think, it is about his or her study objectives - how close they are to existing data and if they fitted to its specific research design (Easterby-Smith et al., 2012). The main disadvantage of using existing statistics is that the data collected for different goal may not be optimal for the considered research problem (Cowton, 1998; Hox & Boijie, 2005; Easterby-Smith et al., 2012). It could create some threats of using available data, particularly it could pose problem related to valid empirical measurement of theoretical concepts. However, due to the tight schedule of conducting the master thesis, the benefits, which are provided by the using of secondary data, will be very valuable in terms of time and effort. Accessed data of the current investigation serve to answer our research question and provide us with a wide sample base.

The actual purpose of the survey (Innobarometer 2010) used in the work was “to study the innovation strategies of the European public administration sector in response to changing constraints and opportunities” (European commission, 2011:4). Keeping this in mind, we will use current questionnaire in order to reach the goal of our thesis, which refers to the determination of the relationship between ideas from employees and the innovation effect and revealing the factors influencing employee-driven innovation in the public sector. The goals seem to be very different; however, despite this, the questionnaire and its results were found suitable to the investigation.

The current survey (Innobarometer 2010) was conducted by Gallup organization collaboratively between MERIT and European Commission in October 2010. The Innobarometer covers 27 EU Member States, Norway and Switzerland and was developed under the Flash Eurobarometer framework. All in all 4,063 public organizations across Europe were interviewed by using a fixed-line telephone method. Target audience were represented by senior managers responsible for strategic planning and decision making (by Executive Directors in bigger organizations and by Chief Executive for smaller ones). The sample comprises pre-selected numbers of responses within each of the participating countries starting from 10 responses for the smallest countries such as Malta, Cyprus and Luxembourg to 400 for the largest countries such as UK, Germany, France, Italy, Spain and Poland. The organizations for sample were taken from publicly available lists of companies, which were composed by national institutes and were randomly selected. However, sampling was made via the stratification criteria (the company size 10 or more employees) (European Commission, 2011).

IB questionnaire consists of information about organization and main body of questionnaire, comprising seven parts (European Commission, 2011). These parts include questions about types of innovation, workforce and skills, innovation effect, drivers and strategy, barriers, procurement and expected developments in the next two years (see Appendix 1). 3, 384 (91,5%) from 4, 063 public sector organizations reported any innovation activity, and, therefore, they were eligible to answer further questions about information source, workforce skills, innovation effects, strategy, drivers and barriers. However, the Innobarometer survey does not say anything about its response rate. There is information only that it has been obtained 4, 063 answers.

4.4.1 General limitations of IB survey

Limitations of IB survey mainly concern sample and comparability issues. Sample was selected randomly from each country through the most complete lists of public institutions and starts from organizations with at least 10 employees (European Commission, 2011).

Another limitation applies comparability issues across countries. Comparison between countries becomes difficult due to sample frames. A number of country-specific factors may influence on innovation activity in the public sector. It is very difficult to consider and address all these factors with sampling (European Commission, 2011).

Important to notice, that IB results are only suitable for broad assessment of innovation performances in EU27 public sector. This refers to country comparison sample size limitation. For instance, there are many cases, when sample size lower than 50 responses per country. Therefore, the lack of statistical solidity leads to not reliable comparison of the results across Member States countries (European Commission, 2011).

The IB questionnaire limits sectorial comparisons since the question about area of responsibility allow choosing up to three activities. Many organizations participating the interview ascertain more than three areas served and, therefore, their choice of responsibility can be random. This creates overlap and the sectorial results do not too much differ from each other (European Commission, 2011).

The last limitation concerns stratification and weighting of the sample. Due to different nature of public organizations (number of employees, areas of responsibility etc.) and the lack of harmonized categorization, the country samples were not stratified. In other words, it means that organizations for interview were selected fully randomly. So, the results do not need to be

weighted. The problem is that national sample size was determined in a uniform manner: partly from the country size and partly from available public organizations in the countries derived from sample frame. Thus, the size of the sample for each country is not proportionate. Therefore, the weight of national samples was made with a proxy: *the size of the general population in each country* (European Commission, 2011:7).

4.5 Data analysis

The analysis section will start with conduction of factor analysis. Factor analysis is necessary to imply due to the fact that the constructs using in our work were newly developed from the Innobarometer survey. New developed constructs are latent variables that cannot be measured directly. Thus, factor analysis will be applied in order to define items for summing them up into overall measure in order to create respective one-dimensional construct for the next steps of analysis. Moreover, Cronbach's Alpha coefficient in addition to factor analysis will be used to make scale assessment and be sure that measures consistently reflect the constructs that they are measuring, i.e. the reliability and validity of the constructs will be improved.

After verification that developed constructs are defined correctly, we can proceed to preliminary analysis. In the preliminary analysis descriptive statistics and correlations between variables (dependent, independent and control) will be examined by using standard software for statistical analysis IBM SPSS statistics V.22. In the descriptive statistics values of means, standard deviation and number of cases would be found. Pearson product-moment correlation analysis will be used in order to find correlation coefficients. Correlation matrix is going to be developed to check multicollinearity, its presence makes regression analysis unworthy. Multicollinearity appears when there is a strong correlation between two or more predictors. According the literature, correlation is assessed as strong, if its value above .80 or 0.90 (Field, 2013).

Testing of the first four hypotheses will be done through OLS regression. It is a statistical technique that helps to determine the linear relationship between two or more variables representing the direction and strength of this relationship in the form of an equation. Regression analysis helps to understand how variation in one variable co-occurs with variation in another. Particularly, it shows how the value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed (Campbell & Campbell, 2008).

Worth mentioning, that OLS regression can be conducted in form of bivariate or multiple regression analysis. A bivariate regression looks at the relationship between one independent variable and one dependent, while a multiple regression assumes the relationship between multiple independent variables and one dependent (Field, 2013).

Usage of multiple regression models allows to control variables. Control for variables helps to account for spurious relationships, they measure the impact of any given variable above and beyond the effects of other variables (Sweet & Grace-Martin, 2012). Existence of control variables can radically change the bivariate relationship between predictor and the dependent variable in the multiple regression models: the relationship could be strengthened or weakened, sign can change, or remain relatively unchanged (Ilvento, 2008).

The organization's size and the area served by the organization will used as controls variables as they may have an impact on a dependent variable. Due to this, it will be possible to better estimate the relationships between variables in which we are interested in (Field, 2013).

In the hypotheses five, six, seven and eight stated that there is a mediation effect between factors and positive effects of innovations. Mediation effect (or indirect effect) occurs when the causal effect of an independent variable on a dependent variable is transmitted by a mediator. In other words, predictor affects outcome, because this predictor affects mediator, and the mediator, in turn, affects outcome. (Kristopher et al., 2007).

In our case mediation effect supposed that management support, top-down decision making strategy, favourable environment affect the size of positive effects from innovations through its effect on ideas from employees. In a mediation analysis, researchers typically ask two questions: whether there is a statistically significant mediated path from predictor variable to outcome via mediator variable; and whether there is also a significant direct path from predictor variable to outcome (Warner, 2013). Thus, the same questions would be answered through testing the four mediation hypotheses. The method of testing moderation model through a series of regression analyses suggested by Baron and Kenny will be used to test these hypotheses. This technique will be described in detail in the section 5.4 of analysis.

4.6 Validity and reliability

Since we are using the results from published source, one may say that there is no need to improve reliability of the measures. It is so if you are using an accepted scale and the same constructs as in the source. The Innobarometer questionnaire, which is underlying the master

thesis, was not developed specifically for the purpose of this investigation. In this regard, new constructs were drawn by choosing relevant items. Hence, the question of reliability arises. In order to check it and increase Altermatt (2007) suggests applying factor analysis and Cronbach's Alpha coefficient. Moreover, to be sure in accurate description of the things, which were revealed and measured, their validity has to be checked.

Validity concept, using in quantitative study differs in nature from the notion of validity in the qualitative research. Quantitative analysis requires the presence of both internal and external validity. The internal validity ensures that research results reflect reality accurately. In order to maximize internal validity of the research all alternative explanations for the differences among groups have to be eliminated, i.e. there is requirement of random assignment. The concept of external validity allows you to define if the patterns from the sample, which were explored, will be valid in other settings and contexts i.e. whether the results can be generalized across all population (Easterby-Smith et al., 2012). Taking into account that this research was inspired by positivism, mentioned types of validity will be used.

Since the new constructs were developed in the paper, they need to be empirically validated. The measurements used in Innobarometer 2010 are not empirically validated for the developed constructs. Thus, with the help of our supervisor, new research model and hypotheses were constructed, through which necessary items were identified in order to measure the components. These items were extracted from Innobarometer survey according to our constructed components and presented in Table 2 Multiple items underlying each component represent abstractions of phenomena to observe it. Table 2 also shows the number of items, which describe a component; the measurements of these items; and also the variable's type.

Table 2. Overview of items

Component/constructs	Items (European Commission, 2011)	Answers (measurements)	Variable type
Incentives (1 item)	Q17.c) Staff have incentives to think of new ideas and take part in their development	Not at all – 0; Partly – 1; Fully – 2.	Independent variable
Education (1 item)	Q8) In 2010, approximately what percent of your organization's employees had a university degree?	0% - 0; Between 1% and 9% - 1; Between 10% and 24% - 2; Between 25% and 49% - 3; Between 50% to 74% - 4; 75% or more – 5.	Independent variable

Workforce skills (3 items)	Q10.) Since January 2008, did your organization provide training for your employees specifically for implementing, using or providing...? a) New or improved services; b) New or improved communication methods; c) New or improved processes or organizational methods.	No – 0; Yes – 1.	Independent variable
Management support (2 items)	Q17.) How well do the following apply to your organization since January 2008? a) Managers support trial-and-error testing of new ideas; b) Managers take an active role in developing and implementing innovations.	Not at all – 0; Partly – 1; Fully – 2.	Independent variable
Favourable environment (5 items)	Q19.) Since January 2008, did your organization put out tenders to private businesses to provide any of the following goods and services? a) ICT equipment or systems; c) Other types of technology; d) Consulting to recommend, design or pilot test new or improved services ; e) R&D for new technologies and services. d) Provide one or more services to your users	No – 0; Yes – 1.	Independent variable
Top-Down decision making strategy (5 item)	Q16.) How important were the following political or legislative factors in driving the development and introduction of your innovations since January 2008? a) Mandated decrease in your organization’s budget; b) Mandated increase in your organization’s budget; c) New laws or regulations; d) New policy priorities; e) Mandated introduction of new e-government or online services.	Not important – 0; Somewhat important - 1; Very important -2.	Independent variable
Positive effects of innovations (11 item)	Q11.) Have any of your new or significantly improved services, introduced since January 2008, had a major positive effect by: 1) Enabling your organization to offer services to more or new types of users; 2) Enabling your organization to better target its services; 3) Improving user satisfaction; 4) Improving user access to information; 5) Enabling faster delivery of services ; 6) Other positive effect.	No – 0; Yes – 1.	Dependent variable
	Q12.) Have any of your new or significantly improved processes or organizational methods, introduced since January 2008, had a major positive effect by:	No – 0; Yes – 1.	

	<ul style="list-style-type: none"> 1) Simplifying administrative procedures; 2) Reducing costs for providing services; 3) Enabling faster delivery of services; 4) Improving employee satisfaction or working conditions; 5) Other positive effect. 		
Ideas from employees (2 items)	<p>Q14.) Since January 2008, how important were the following information sources for the development of your innovations?</p> <ul style="list-style-type: none"> a) Ideas from management; b) Ideas from staff. 	<p>Not important - 0; Somewhat important - 1; Very important -2.</p>	Dependent / Mediator variable
Barriers (7 items)	<p>Q18.) Since January 2008, how important were the following factors in preventing or delaying your organization's efforts to develop or introduce new or significantly improved services, communication methods, processes or organizational methods?</p> <ul style="list-style-type: none"> a) Lack of management support; b) Lack of incentives for your staff; c) Staff resistance; d) Uncertain acceptance by the users of your services; e) Regulatory requirements; f) Lack of sufficient human or financial resources; g) Risk-averse culture in your organization. 	<p>No importance – 0; Low importance – 1; Medium importance – 2; High importance – 3.</p>	Independent variable

Generally simple statistics can be used for data investigation and interpretation. However, more often it requires complex multivariate statistics, which allows gain knowledge from the data. Such techniques as regression and factor analysis refer to multivariate statistics and are quite popular in research in terms of creating new knowledge. However, reliability and validity of items' scale have to be checked before conducting the empirical analysis. According Anderson & Gerbing (1982) in order to ensure validity of the constructed components the evaluations of scale reliability, scale unidimensionality, discriminant and convergent validity should be done in a factor analysis. In addition, the accuracy of measurement involves the use of reliability tests and factor analysis.

Factor analysis includes six basic procedures: 1) Confirmatory factor analysis (CFA); 2) Varimax rotation; 3) Decision on the number of extracted and rotated factors; 4) Evaluation of interpreted ability of a rotated factor; 5) Cronbach's alpha coefficient; 6) Successive analysis.

1) Confirmatory factor analysis shows first of all if the constructed components are reliable and valid and also whether the components fit to the model. Researcher has to make correlation of these factors and compare which items correspond to these factors. Principal

components analysis is common used technique to study all subsets of items to estimate each factor and verify its validity and reliability (Hollanders & Arundel, 2008). 2) Varimax rotation is used to improve interpretability of the factors. 3) The decision on the number of extracted and rotated factors is based on eigenvalue of a factor i.e. *on the amount of the total variance explained by the factor* (Hair et al., 2010). 4) The interpreted ability of a rotated factor result assessed according to .50/.30 criterion. 5) Cronbach's alpha coefficient is the most popular measure of scale reliability (Field, 2009). It shows viability of a factor, by measuring the items' internal consistency (Cronbach, 1951). Since Cronbach's Alpha is coefficient, it is estimated in the interval from 0 to 1. The acceptable level for an Alpha usually starts from 0.60, however some investigators start from even 0.70 minimum acceptable level (Nunally, 1997). And finally 6) the successive alpha analysis will be employed if some other factor structure appeared i.e. some items would be deleted (Cronbach, 1951).

Eventually, the results of factor analysis will be used to prove reliability and validity of the established factors.

4.7 Summary

The chapter reveals the methodology, methods and techniques applied in the work. Since the study based on the positivist epistemology the corresponding research design employed. Therefore, data collection and subsequent analysis is maid in accordance with positivism. Important to notice, the weak form of positivism was employed due to the fact that we use available survey, comprising large sample of public organizations. The data are expressed in quantitative form and will be analysed in software for statistical analysis IBM SPSS Statistics.

The usage of factor analysis and Cronbach alpha coefficient ensures the reliability and validity of the conducted research.

5. Results of the data analysis

5.1 Factor analysis

Due to the fact that the constructs were newly developed using the Innobarometer survey, they are latent variables that can't be measured directly. Therefore, the reliability should be checked and improved. It was done using such techniques as factor analysis and Cronbach's Alpha. In other words, we must be sure that measures consistently reflect the constructs that they are measuring. Also, the factor analysis helps to define items for summing them up into overall measure in order to create respective one-dimensional construct for the next steps of analysis.

In order to identify underlying constructs a principal axis factor analysis (PAF) was applied on the 33 items. PAF is one of the most popular estimation in factor analysis and its estimations are more robust than principal component analysis (PCA), as a possible alternative (De Winter & Dodou, 2012).

After extracting factors, their initial interpretation may be difficult. Thus, the varimax method of orthogonal rotation was used to increase the interpretation of factor results.

Reliability of factor analysis depends on sample size, therefore in order to measure the sample adequacy the KMO and Bartlett's Test was calculated. It can vary from 0 to 1, and in our case the result is equal to .865 that is well above the minimum criterion of .5 and tells that the sample size is adequate for factor analysis ('meritorious' according to Hutcheson & Sofroniou, 1999) (Field, 2013). The Anti-image correlation matrix provides the KMO values for individual items. These values situated on the diagonal of the matrix, and as in the previous test, their values should be above .5 (Field, 2013). All the values are above .5, i.e. above of the acceptable limit. The Correlation matrix did not indicate any problem in terms of multicollinearity.

In order to determine which factors could be retained and which factors could be discarded the Kaiser's criterion and the scree plot can be applied. Kaiser's criterion tells that factors with eigenvalues greater than 1 should be retained. According this criterion, 7 factors with 51.177% of total variance explained should be retained (Appendix 2). In order to verify the correctness of the result the scree plot was applied. The scree plot showed inflexion point that also justifies retention of 7 factors (Appendix 3). Reproduced Correlations output shows that

there are 12 (2.0%) nonredundant residuals (differences between actual and reproduced correlations) with absolute values greater than 0.05 reflecting that the model fits well.

Table 3 shows factor loadings after rotation. In order to save space the table contains only the index of items. All items are highly loaded (above .4 according to Field, 2013) only on one factor (Table 3). Secondary loadings of all items are less than 0.3. Most of items primarily load to the factors as was expected due to the constructs. For example, the first group of items which were intended to measure barriers is loaded on the factor with loadings ranging from 0.505 to 0.738. However, two items (Q11.6, Q12.5) that are intended to measure a positive effects of innovations (factor 2) construct are loading to the different factor (factor 7). That could be caused due to the way questions are formulated. Despite this fact we will regard these items as a part of positive effects of innovations construct as they reflect the idea of this construct and their elimination will cause the bias in measurement of positive effects of innovations.

In order to check the reliability of constructs Cronbach's Alpha was calculated. Due to the existence of several subscales it is suggested that it should be done separately with items related to different subscales (Cronbach, 1951). Despite the fact that Cronbach's Alpha depends on the number of items on the scale, the most broadly used in the literature values of .7 to .8 are suggested as acceptable, in some cases even .5 (Field, 2013).

Table 3 also represents the results of reliability analysis. In Appendix 4 the full output from reliability analysis can be found. Most of the constructs have Cronbach's Alpha above .7, and only top-down decision making strategy and management support structures have $\alpha=.68$ and $\alpha=.67$ respectively. These values we consider as acceptable.

Tables Item-Total Statistics from the reliability output reveal two important characteristics to take into account: Corrected Item-Total Correlation and Cronbach's Alpha if Item Deleted. The first parameter shows the correlation between each item and the total score from the subscale. In reliable scales all items should correlate with total and according the literature this correlation should be above .3 (Field, 2013). The second characteristic shows the overall Cronbach's Alpha value if the item will be not included in the subscale.

Table 3. Factor analysis (varimax rotation) computed with 33 items of the Innobarometer questionnaire

Item	Factor						
	1	2	3	4	5	6	7
Q18.b. Lack of incentives for your staff	,738						
Q18.c. Staff resistance	,731						
Q18.a. Lack of management support	,719						
Q18.d. Uncertain acceptance by the users of your services	,707						
Q18.g. Risk-averse culture in your	,662						
Q18.e. Regulatory requirements	,568						
Q18.f. Lack of sufficient human or financial resources	,505						
Q11.2. Enabling to better target its services		,614					
Q11.5. Enabling faster delivery of		,597					
Q12.3. Enabling faster delivery of services		,590					
Q11.3. Improving user satisfaction		,521					
Q11.4. Improving user access to		,501					
Q12.1. Simplifying administrative procedures		,460					
Q11.1. Enabling your organisation to offer services to more or new types of users		,451					
Q12.2. Reducing costs for providing services		,437					
Q12.4. Improving employee satisfaction or working conditions		,426					
Q19.f. Provide one or more services to your			,638				
Q19.d. Consulting to recommend design or pilot test new or improved services			,622				
Q19.c. Other types of technology			,586				
Q19.a. ICT equipment or			,577				
Q19.e. R&D for new technologies and			,572				
Q16.c. New laws or regulations				,685			
Q16.d. New policy priorities				,545			
Q16.a. Mandated decrease organisation's budget				,484			
Q16.e. Mandated introduction of new e-government or online services				,445			
Q16.b. Mandated increase in your organisation's budget				,444			
Q10.b. New or improved communication methods					,692		
Q10.a. New or improved services					,650		
Q10.c. New or improved processes or organisational methods					,611		
Q17.a. Managers support trial-and-error testing of new ideas						,676	
Q17.b. Managers takes an active role in developing and implementing innovations						,645	
Q12.5. Other positive effects							,814
Q11.6. Other positive effect							,434

Factor 1: Barriers ($\alpha=.86$)

Factor 2: Positive effects of innovations ($\alpha=.73$)

Factor 3: Favourable environment ($\alpha=.76$)

Factor 4: Top-Down decision making

strategy ($\alpha=.68$)

Factor 5: Work skills ($\alpha=.75$)

Factor 6: Management

support ($\alpha=.67$)

From the output it can be seen that only two items (Q11.6, Q12.5) in positive effects of innovations construct have correlations lower than .3 and the value of overall Cronbach's Alpha higher if they will be deleted. However, as it was discussed before, these items will be kept as we regard them essential for the further analysis. Furthermore, the overall Alpha accepted range with value equal to .73.

Having performed the factor analysis and having found reliability of the constructs it is possible to calculate composite scores in order to form reliable and valid measures of theoretical constructs.

The first construct is the 'Barriers'. It consists from 7 items: Q18.a...Q18.f, which answers can vary from 'No importance' (coded as 0) to 'High importance' (coded as 3). All the items are mainly loaded on factor 1. Their primary loadings are above .5 and secondary loadings on the other factors are less than .3. Cronbach's Alpha for these items is equal to .86, indicating that the measure consistently reflects the construct that it is measuring. To calculate a composite score that measures the barriers we summed up items Q18.a...Q18.f and divided the sum by the number of items, doing so we got a new single variable (*BarrComp*) instead of 7 different items.

The second construct is the 'Positive effects of innovations'. It consists from 11 items: Q11.1...Q11.6, Q12.1...Q12.5, which answers can be 'No' (coded as 0) and 'Yes' (coded as 1). All the items are mainly loaded on the factor 2. Their primary loadings are above .43 and secondary loadings on the other factors are less than .3. Cronbach's Alpha for these items is equal to .73, indicating that the measure consistently reflects the construct that it is measuring. All the items were summed up in order to form a new variable (*Eff_SUM*) that characterizes the positive effects of innovations. However, it was assessed not in terms of strength of one single effect but as the sum of different effects that were recognized by organization. The new variable will range from '0' to '11', where '0' means that there was no positive effects of innovation at all and '11' means existence of multiple positive effects.

The third construct is the 'Favourable environment'. It consists from 5 items: Q19.a, Q19.c...Q19.f, which answers can be 'No' (coded as 0) and 'Yes' (coded as 1). All the items are mainly loaded on the factor 3. Their primary loadings are above .57 and secondary loadings on the other factors are less than .3. Cronbach's Alpha for these items is equal to .76, indicating that the measure consistently reflects the construct that it is measuring. All the

items were summed up in order to form a new variable (*FavEnv*) that characterizes the favourable environment. The new variable ranges from '0' to '5' and reflects the scale on which organization provides goods and services to create favourable working environment.

The fourth construct is the 'Top-Down decision making strategy'. It consists from 5 items: Q16.a...Q16.e, which answers can vary from 'No importance' (coded as 0) to 'High importance' (coded as 3). All the items are mainly loaded on the factor 4. Their primary loadings are above .44 and secondary loads on the other factors are less than .3. Cronbach's Alpha for these items is equal to .68, indicating that the measure consistently reflects the construct that it is measuring. To calculate a composite score that measures the top-down decision making strategy we summed up items Q16.a...Q16.e and divided the sum by the number of items, doing so we got a new single variable (*StratCom*) instead of 5 different items. This variable reflects the scale on which legislation and political factors influence innovations development.

The fifth construct is the 'Work skills'. It consists from 3 items: Q10.a, Q10.b ...Q10.c, which answers can be 'No' (coded as 0) and 'Yes' (coded as 1). All the items are mainly loaded on the factor 5. Their primary loadings are above .61 and secondary loadings on the other factors are less than .3. Cronbach's Alpha for these items is equal to .75, indicating that the measure consistently reflects the construct that it is measuring. All the items were summed up in order to form a new variable (*WSkills*) that characterizes the work skills of employees. The new variable ranges from '0' to '3' and reflects the scale on which organization provides training to employees.

The sixth construct is the 'Management support'. It consists from 2 items: Q17.a, Q16.b, which answers can vary from 'Not at all' (coded as 0) to 'Fully' (coded as 2). All the items are mainly loaded on the factor 6. Their primary loadings are above .65 and secondary loads on the other factors are less than .3. Cronbach's Alpha for these items is equal to .67, indicating that the measure consistently reflects the construct that it is measuring. To calculate a composite score that measures the management support we summed up the items and divided the sum by the number of items. Thus, we got a new single variable (*ManSupC*) instead of 2 different items.

5.2 Preliminary analysis

The descriptive statistics and correlations between variables (dependent, independent and control) were obtained and represented in Table 4. Descriptive statistics include means (M), standard deviation (SD) and number of cases (N). Correlation coefficients were found using Pearson product-moment correlation analysis (Field, 2013).

Correlation matrix in this Table 4 allows checking for multicollinearity. It is necessary as the next steps of research include multiple regression analysis with more than one variable. Multicollinearity exists when there is a strong correlation between two or more predictors. Thus, it becomes impossible to obtain unique estimates of the regression coefficients: b coefficients become untrustworthy; it limits size of R^2 ; it makes difficult to assess individual importance of a predictor. According the literature, these effects start to be significant when variables have correlation above .80 or 0.90 (Field, 2013).

It can be seen that most of correlations are significant and the strongest correlation was found between Barriers and Top-Down decision making strategy with $r=.382$ ($p<0.01$). All correlation coefficients are below critical values indicating the absence of multicollinearity.

Table 4. Descriptive statistics and Pearson correlation matrix of the dependent and independent variables.

		N	SD	M	1	2	3	4	5	6	7	8	9
1	Ideas from employees	3273	0,63	1,37	1								
2	Positive effects of innovations	3212	2,52	5,85	,211**	1							
3	Incentives	3630	0,74	2,03	,237**	,119**	1						
4	Workforce skills	3226	1,06	2,24	,160**	,367**	,080**	1					
5	Education	3414	1,53	2,30	,063**	,045*	-,058**	,188**	1				
6	Management support	3149	0,61	1,19	,246**	,247**	,245**	,197**	,180**	1			
7	Top-Down decision making strategy	2618	0,52	1,12	,156**	,186**	,065**	,197**	,079**	,185**	1		
8	Barriers	3187	0,80	1,66	,113**	,067**	,007	,134**	,196**	,128**	,382**	1	
9	Favourable environment	3279	1,70	1,91	,094**	,326**	,036**	,291**	,146**	,230**	,187**	,158**	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

5.3 Hypotheses 1, 2, 3, 4. Regression analysis

This section is dedicated to testing of hypotheses 1, 2 and 3. It was done by conducting an OLS regression analysis.

It is a statistical technique that helps to determine the linear relationship between two or more variables representing the direction and strength of this relationship in the form of an equation. Regression analysis helps understand how variation in one variable co-occurs with variation in another. Particularly, it shows how the value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed. However, regression cannot show the direction of causation, and it was determined analytically through substantive theory (Campbell & Campbell, 2008).

While a bivariate regression analysis looks at the relationship between one independent variable and one dependent, a multiple regression analysis assume the relationship between multiple independent variables and one dependent (Field, 2013).

Usage of multiple regression models allow to control variables. Control for variables helps to account for spurious relationships, they measure the impact of any given variable above and beyond the effects of other variables (Sweet & Grace-Martin, 2012). Existence of control variables can radically change the bivariate relationship between predictor and the dependent variable in the multiple regression models: the relationship could be strengthened or weakened, sign can change, or remain relatively unchanged (Ilvento, 2008).

The organization's size and the area served by the organization were used as controls variables as they may have an impact on a dependent variable. Due to this, it will be possible to better estimate the relationships between variables in which we are interested in (Field, 2013).

Basic and the most important parameters in regression analysis that will help in drawing insights are: R squared (R^2); standardized (β) and unstandardized (b) beta coefficients; standard error (SE B); significance probability (p-value); confidence interval. R^2 shows how much of the variance in the outcome variable is accounted for by the regression model from the given sample. It can range from 0 (0%) to 1 (100%). Beta regression coefficient represents the gradient of the regression line and the strength of the relationship between independent and dependent variables. The standardized beta value indicates the strength of this relationship in standardized form, i.e. all changes are represented in standard deviations. This

fact makes standard coefficient directly comparable and allows telling about importance of each predictor. Sig. tells about how significant the contribution of predictor variable in prediction of outcome was. Confidence interval is a range of values around a calculated statistic that is believed with the certain probability to contain the true value of that statistic (Field, 2013).

Hypothesis 1

Hypothesis one stated that *ideas from employees as a source of information positively influence on public sector innovation*. In other words, it means that the higher the importance of employees' ideas as sources of information for innovation development, the more positive innovation effect will be in an organization.

In order to test this hypothesis, firstly, the bivariate regression analysis between ideas from employees and positive effects of innovation was performed. Its results are represented in the Table 5 (full output in Appendix 5).

Table 5. Bivariate regression analyses of the relationships between ideas from employees and positive effects of innovation

Hypothesis 1	b	SE B	β	p
Ideas from employees	.847	.070	.211 **	p<.001

N=3273
 $R^2=.045$
 adj. $R^2=.044$

From the result it can be seen that independent variables positively and significantly influence dependent variable. The beta value is equal to .211, $p<.001$ and can be characterized as modest. The values of R^2 and adj. R^2 are very close to each other indicating that the cross-validity of this model is good (Field, 2013). Despite this, R^2 value is just 0.045. It means that 4.5% of the variance in the outcome is accounted for by the regression model from the obtained sample.

From the bivariate regression analysis perspective the hypothesis was supported. Nevertheless, it is reasonable to test it using multiple regression analysis controlling for other variables that influence the outcome variable, such as size of organization, area served, management support, top-down decision making strategy, favourable environment and

barriers. Because of the missing data, variables in the model have different number of cases (N ranges from 2618 for favourable environment to 3296 for area served by the organization). In order to deal with a missing date a pairwise method to exclude cases was used. It means that a case will be excluded only from calculations involving the variable for which there is no score (Field, 2013). This approach allows using more data in analyses. A result of the analysis is represented in the Table 6 (full output in Appendix 6).

Table 6. Multiple regression analyses between ideas from employees and positive effects of innovations controlling the influence of other factors

Hypotheses	Variables	b	SE B	β	p
H1	Ideas from employees	.534	.078	.133**	p<.001
	Size of organization	.202	.031	.137**	p<.001
	Area served by the organization	.027	.082	.006	P=.744
	Management support	.504	.084	.121**	p<.001
	Top-Down decision making strategy	.457	.100	.095**	p<.001
	Favourable environment	.322	.031	.216**	p<.001
	Barriers	-.106	.066	-.033	P=.104

** . Correlation is significant at the 0.01 level (2-tailed).
 $R^2=.183$
adj. $R^2=.181$

Introduction of control variables decreased but did not radically change the strength of the relationship and its direction. However, the beta value of predictor decreased from .211, p<.001 to .133, p<.001. Introduction of control variables increased R^2 of the models from .045 to .183. Nevertheless, only area served by the organization and barriers had not significant influence on the outcome as a control variable. The influence of other variables on the outcome was significant making it reasonable to use them as control variable. We can conclude that Hypothesis one is supported thereby indicating that ideas from employees as a source of information positively influence on public sector innovations.

Hypothesis 2, 3, 4

This section is dedicated to hypotheses 2, 3, 4. They will be also tested OLS using regression analysis.

Hypothesis two stated that *incentives for employees increase importance of their ideas for innovation development*. It means that when employees have incentives to think of new ideas and take part in their development, they become more important as sources of information for innovation.

Hypothesis three stated that *workforce skills positively influence importance of employees' ideas for innovation development*. It means that more skilled employees are more important as sources of information for innovation.

And hypothesis four stated that *education positively influences importance of employees' ideas for innovation development*. It means that increase in amount of employees with university degree will lead to higher importance of employees' ideas for innovation development.

Three bivariate regression analyses separately performed according the stated hypotheses showed the next output Table 7 (full output in Appendix 7, 8, 9).

Table 7. Bivariate regression analyses for Hypothesis 2 (H2), Hypothesis 2 (H2), Hypothesis 3 (H3).

Hypotheses	Variables	b	SE B	β	p	R ²	Adj. R ²	N
H2	Incentives	0.201	0.015	.237**	p<.001	.056	.056	3258
H3	Workforce skills	0.95	0.010	.160**	p<.001	.026	.025	3226
H4	Education	0.26	0.08	.063**	p=.001	.004	.004	3047

** . Correlation is significant at the 0.01 level (2-tailed).

From the obtained data it can be seen that all predictors positively and significantly influence dependent variable, telling that increase in predictor leads to increase of the outcome. Standardized beta value for incentives is significant and equal to .237, p<.001 and can be characterized as modest. Beta value for workforce skills is also significant and equal to .160, p<.001 and also can be characterized as modest. The lowest beta value was for education that was also significant and equal to .063, p=.001 and can be characterized as very weak. The values of R² and adj. R² are very close to each other indicating that the cross-validity of these models is good (Field, 2013). Despite this, R² values are very low. The highest value is for incentives (R²=.056) and lowest one is for education (R²=.004). By adding more explanatory variables in the model it is possible to achieve higher values of R² and thereby to increase its explanatory power. However, the low value of R² is not necessary bad as it

depends of what is measured and how. For example, what can be good result in one field of science in other will indicate poor one (Seltman, 2014).

From the bivariate regression analysis perspective all the hypotheses were supported. Nevertheless, due to the fact that there is a significant correlation between variables (Table 4) it could be reasonable also to perform multiple regression analysis including in the model all the predictors and variables that influence outcome. This approach and control of others variables allow to find ‘pure’ relationships between predictors and outcome.

Table 8. Multiple regression analysis between incentives (H2), workforce skills (H3), education (H4) and ideas from employees (all three hypotheses are tested in one regression model).

Hypothesis		b	SE B	β	p
H2	Incentives	,166	,017	,195**	p<.001
H3	Workforce skills	,046	,012	,078**	p<.001
H4	Education	,003	,009	,006	p=.769
	Size of organization	,024	,008	,064**	P=.003
	Area served by the organization	,039	,022	,037	p=.077
	Management support	,152	,022	,146**	p<.001
	Top-Down decision making strategy	,087	,026	,072**	P=.001
	Favourable environment	-,006	,008	-,016	P=.477
	Barriers	,047	,017	,058**	p=.007

** . Correlation is significant at the 0.01 level (2-tailed).
 N=2618...3630
 $R^2=.121$
 adj. $R^2=.118$

Table 8 shows the output from multiple regression analysis with all the predictors included in analysis (incentives, workforce skills, education, area served by the organization, management support, top-down decision making strategy, favourable environment, barriers) together with the control variables (size of organization, area served by the organization) (full output in Appendix 10). Introduction of new variables made a great impact on strength and significance of relationships. Standardized beta values of incentives increased from .237, p<.001 to .195, p<.001 and beta value of workforce skills decreased from .160, p<.001 to .078, p<.001. Nonetheless, it clearly indicates that incentives and workforce skills positively influence the outcome. However, beta value of education decreased from .063, p=.001 to

.006, $p=.769$, that makes influence on importance of employees' ideas for innovation development insignificant. The introduction of new variables increased R^2 of the models. The result (Table 8) showed that an effect from area served by the organization and favourable environment had not significant influence on the outcome. While other control variables had a significant positive influence on the outcome.

Testing all three hypotheses in one model allowed to control the effect of variables on each other. It highlighted the role of incentives in prediction of importance of employees' ideas for innovation development and at the same time it made insignificant the influence of education. Thus, we can conclude that hypotheses one and two were supported and hypothesis three was rejected.

5.4 Hypotheses 5, 6, 7 and 8

Hypotheses five, six, seven and eight suppose that the relation between predictor and the outcome is mediated through a mediator variable. It means that management support, top-down decision making strategy, favourable environment affect the size of positive effects of innovations through its effect on ideas from employees.

In greater detail, it looks like the next:

Hypothesis six suggested that *Top-down decision making strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of top-down decision strategy on positive effects of innovations;

Hypothesis seven suggested that *Environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of environment on positive effects of innovations;

And hypothesis eight suggested that *Barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of barriers on positive effects of innovations.

Mediation effect (or indirect effect) occurs when the causal effect of an independent variable on a dependent variable is transmitted by a mediator. In other words, predictor affects outcome because this predictor affects mediator, and the mediator, in turn, affects outcome. (Kristopher et al., 2007).

In a mediation analysis, researchers typically ask two questions: whether there is a statistically significant mediated path from predictor variable to outcome via mediator variable; and whether there is also a significant direct path from predictor variable to outcome (Warner, 2013). Thus, the same questions were answered through testing these four hypotheses.

The basic mediation model is represented in Figure 7. In this model variable X (predictor) is causally influencing variables Y (outcome) and M, and variable M is causally influencing Y (Hayes, 2013; Field, 2013; Warner, 2013).

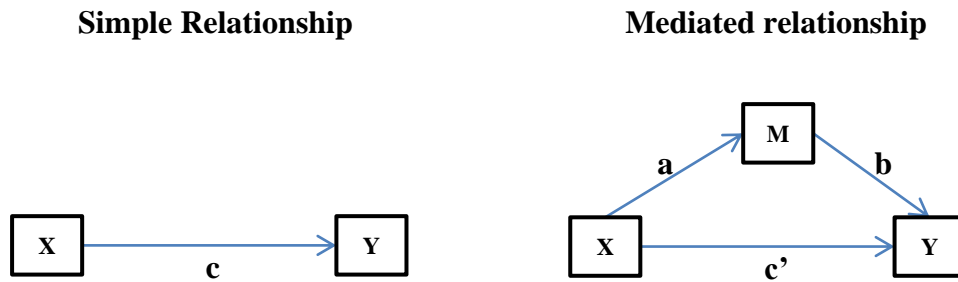


Figure 7. A conceptual diagram of simple mediation model

In this model there are two distinct pathways by which a variable X influencing Y. The first pathway is called direct effect. It is a pathway that goes from X directly to Y without passing M. The second pathway from X to Y is called indirect effect. It firstly goes from X to M and then from M to Y. In this case M is called mediator variable. The indirect effect represent how X influence Y through this casual sequence (Hayes, 2013).

The mediation model represented in Figure 7 is too simplified. More variables that effect a model might be added in order to increase its accuracy. However, it is impossible account for all influences (Hayes, 2013).

Mediation models are sensitive to confounding and epiphenomenal associations. Confounding or spurious associations pose a threat to validity. Confounding is presented if the relationship between variables can be attributed to a third variable that causally affects both. Epiphenomenal association appears if X is correlated with a cause of Y but does not itself causally influence Y. However, these effects can be reduced through statistical control, adding them as additional variables (C) to the mediation analysis (Figure 8) (Hayes, 2013).

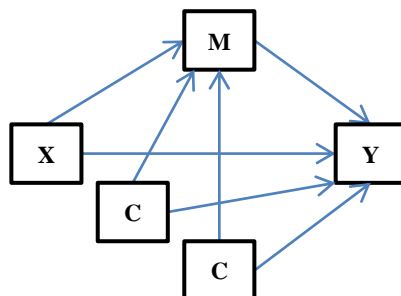


Figure 8. A simple mediation model with control variables

In practice a mediation will be recognized if the strength of relationship between X and Y is reduced by including a mediator. Mediation may occur in two ways, perfect and partial. The

perfect mediation occurs when the direct effect from X on Y totally reduced after including mediator in the model. While partial mediation would exist if the direct effect remains significant (Field, 2013).

The most common method of testing mediation model is through a series of regression analyses proposed by Baron and Kenny. It suggests to use next three regression models (Field, 2013):

1. A regression predicting Y from X. It will provide the value of unstandardized regression coefficient c in Figure 7;
2. A regression predicting M from X. It will provide the value of unstandardized regression coefficient a in Figure 7;
3. A regression predicting Y from both X and M. It will provide the value of unstandardized regression coefficients c' and b in Figure 7;

This model tests four conditions that have to be met in order to state presence of mediation: X must significantly predict Y in step one; X must significantly predict M in step two; M must predict Y in step three; and X must predict Y less strongly in step three than in step one (Field, 2013).

In order to interpret direct and indirect effects there can be several ways. For example, one way is to use unstandardized coefficients where the effect is being couched in quantitative terms in the metrics of X and Y. Unstandardized coefficients do not say anything about the absolute size of the direct and indirect effects. Removing the scales of X and Y, it is possible to obtain completely standardized effects. Such coefficients can be compared across the models. The Sobel test can help to estimate a significance of indirect effect. The significance of this test will signalize significance of indirect effect between predictor and outcome (Hayes, 2013).

However, a bootstrapping is suggested to be a better estimator of the extent and significance of indirect effects (Kristopher et al., 2007).

Bootstrapping treat original sample as a miniature representation of the population originally sampled. Statistics of interest are being calculated via process of resampling and replacement of observations in the original sample over thousands of times. Empirically constructed distribution of the statistic is then used for further findings (Hayes, 2013).

Bootstrapping helps to generate an empirically derived representation of the sampling distribution of the indirect effect. It allows to make no assumptions about the shape of the sampling distribution. Confidence intervals calculated with bootstrapping better respect the irregularity of the sampling distribution of the indirect effect, thereby making inferences more accurate. In hypothesis testing it makes test more powerful (Hayes, 2013).

It is suggested to use bias-corrected approach in calculation of confidence interval as it provides additional adjustment based on the skew of the distribution of bootstrap estimates (Hayes, 2013; Field 2013).

Bootstrap confidence intervals are considered as the better approach to inference during the mediation analyses than the normal theory approach. During the bootstrapping specific indirect effects are being estimated and endpoints of the confidence interval are calculated using bias-corrected method. If zero is outside of a confidence interval (CI%), it is considered that indirect effect is different from zero with CI% confidence. And otherwise, if zero is inside the interval it means that there is insufficient evidence that variable X affects variable Y through mediator (M) (Hayes, 2013).

All these described steps can be performed manually in IBM SPSS Statistics software but it is more convenient to use special tools developed for mediation analysis. In order to test mediation hypotheses it was decided to use PROCESS tool. It is a macro designed for SPSS by Professor Andrew Hayes and Kristopher Preacher (Field 2013).

Hypothesis 5

Hypothesis five suggested that *management support is expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of management support on positive effects of innovations.

Relationships supposed by the hypothesis can be represented in the next way (Figure 9):

1. Management support predicts importance of ideas from employees through the patch *a*;
2. Importance of ideas from employees predicts positive effects of innovations through the patch *b*;

3. An influence from management support on positive effects of innovation through the patch c' and moreover, it will be different when importance of ideas from employees (mediator) is also included in the model;
4. Basic relationship between management support and positive effects of innovation through the patch c .

Mediated Relationship

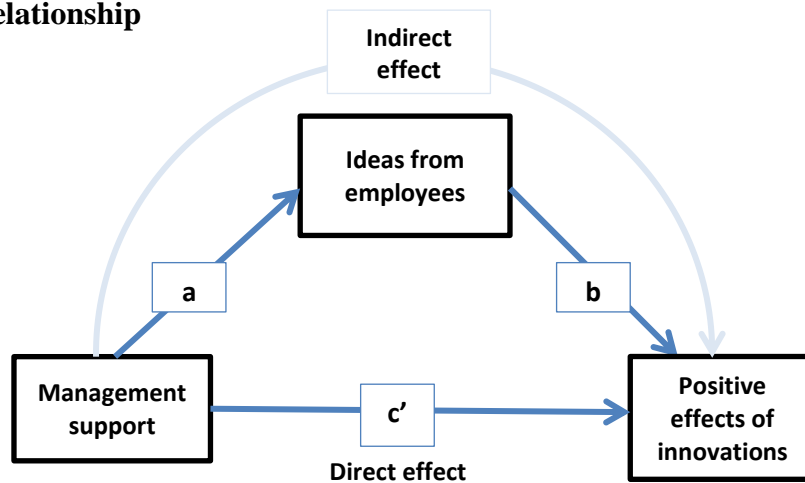


Figure 9. Model of management support as a predictor of positive effects of innovations, mediated by ideas from employees

However, as it can be seen from the (Figure 6; Table 5) there are also other variables that covariate and influence the mediator and the outcome. Such situation is represented in Figure 8. Thus, these variables should be included in the analysis as control variables.

The next three regression models should to be used according approach suggested by Baron and Kenny:

1. A regression predicting the positive effects of innovation (outcome) from the management support (predictor variable). The regression coefficient gives the value of c . This value represents the effect of predictor on outcome in the absence of mediator;
2. A regression predicting the importance of ideas from employees (mediator) from the management support (predictor variable). The regression coefficient gives the value of a ;
3. A regression predicting the positive effects of innovation (outcome) from both the management support (predictor variable) and importance of ideas from employees (mediator). The regression coefficient for management support gives the value of c' , the regression coefficient for importance of ideas from employees gives the value of b .

The values a , b , c , c' represent the unstandardized regression coefficients between variables and thereby, characterize the relations between them.

These are the necessary conditions of mediation in hypothesis five that should be tested by the analysis:

- Management support must significantly predict positive effects of innovation in regression 1;
- Management support must significantly predict importance of ideas from employees in regression 2;
- Ideas from employees must significantly predict positive effects of innovation in regression 3;
- Management support must predict importance of ideas from employees less strongly in regression 3 than in regression 1.

The result of mediation analysis:

A mediation analysis was performed using the Baron and Kenny causal steps approach (full output in Appendix 11) (Field, 2013; Warner, 2013). A bias-corrected bootstrapping was used to conduct confidence interval for the indirect effect according procedures described by Hayes (2013). The initial causal variable was management support, the outcome variable was positive effects of innovation, and the proposed mediator was importance of ideas from employees. Figure 9 represents the relationships in this mediation hypothesis. Results from preliminary data screening (Table 5), big sample size and usage of bootstrapping technique allow to assume that there was not any serious violation of necessary assumptions for mediation analysis. 95% confidence interval was used as a criterion for statistical significance.

All unstandardized regression coefficient obtained from the analysis' output are represented on the Figure 10. The results shows that the total effect from management support on positive effects of innovations was significant $c=0.331$, $t(1924)=3.654$, $p<.001$. That indicates that an increase in management support increases positive effects of innovations. An influence form management support on importance of ideas from employees was also significant, $a=0.132$, $t(1924)=5.445$, $p<.001$. Importance of ideas from employees significantly influenced positive effects of innovations while controlling for management support, $b=0.378$, $f(1923)=4.442$, $p<.001$. The direct effect of management support on positive effects of innovation was

estimated as $c'=0.281$, $t(1923)=3.096$, $p=.002$. The estimated indirect effect was equal to $ab=0.050$. In order to judge about its significance, the bias-corrected bootstrap confidence interval (done with 10000 samples) was calculated and the Sobel test was conducted. The 95% bias-corrected bootstrap confidence interval ranges from 0.024 to 0.087. According the Sobel test, the indirect effect was significant $z=3.409$, $p<.001$. Completely standardized indirect effect was .013 BCa CI [.006, .022].

Based on the fact that coefficients a and b were statistically significant, the Sobel test was also significant and the bootstrap confidence interval for indirect effect did not include zero, we can assume that indirect effect from management support on positive effects of innovations was statistically significant. Also, due to the fact that direct effect from management support on positive effects of innovations was also significant, then the mediation effect can be characterized as partial. Goodness of fit for the model is $R^2=.237$ and means that 23.7% of variance in positive effects of innovations is accounted for by the model.

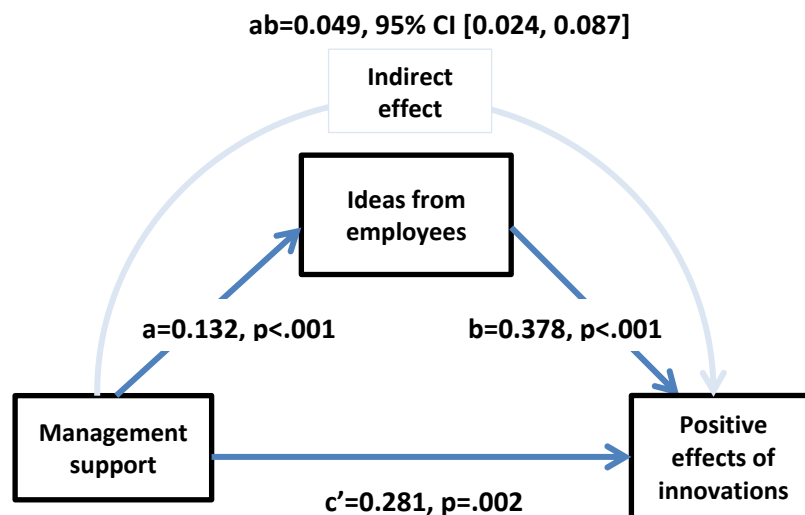


Figure 10. Mediation model with path coefficients for Hypothesis 5

Hypothesis 6

Hypothesis six suggested that *top-down decision making strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, importance of ideas from employees is expected to mediate the effect of top-down decision strategy on positive effects of innovations.

Relationships that are supposed in the hypothesis are presented in the next way (Figure 11):

1. Top-down decision making strategy predicts importance of importance of ideas from employees through the patch a ;
2. Importance of importance of ideas from employees predicts the positive effects of innovation through the patch b ;
3. Relationship between top-down decision making strategy and positive effects of innovation through the patch c' , it will be different when importance of importance of ideas from employees (mediator) is also included in the model;
4. Basic relationship between top-down decision making strategy and positive effects of innovation through the patch c .

Mediated Relationship

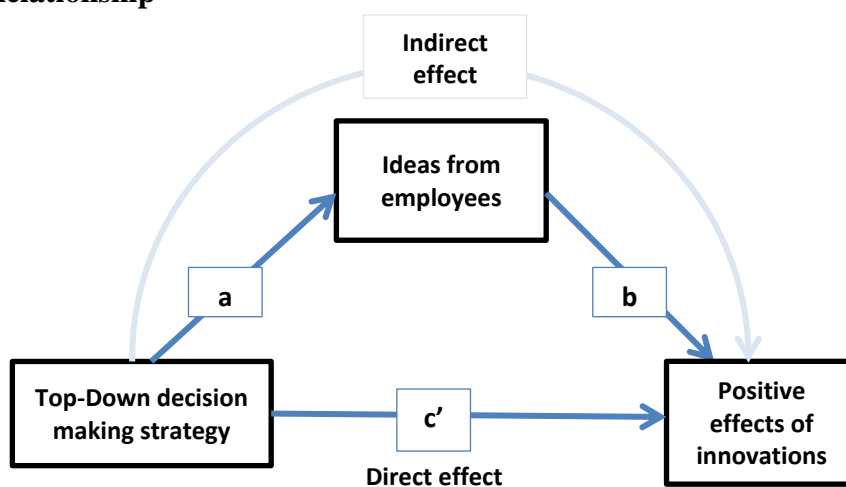


Figure 11. Model of top-down decision making strategy as a predictor of positive effects of innovations, mediated by ideas from employees

However, as it can be seen from the (Figure 6; Table 5) there are also other variables that covariate and influence the mediator and the outcome. Such situation is represented in Figure 8. Thus, these variables should be included in the analysis as control variables.

The next three regression models should to be used according approach suggested by Baron and Kenny:

1. A regression predicting the positive effects of innovation (outcome) from the top-down decision making strategy (predictor variable). The regression coefficient gives the value of c . This value represents the effect of predictor on outcome in the absence of mediator;

2. A regression predicting the importance of importance of ideas from employees (mediator) from the top-down decision making strategy (predictor variable). The regression coefficient gives the value of a ;
3. A regression predicting the positive effects of innovation (outcome) from both the top-down decision making strategy (predictor variable) and importance of importance of ideas from employees (mediator). The regression coefficient for top-down decision making strategy gives the value of c' , the regression coefficient for importance of importance of ideas from employees gives the value of b .

The letters a , b , c , c' represent the unstandardized regression coefficients between variables and thereby, characterize the relations between them.

These are the necessary conditions of mediation in hypothesis six that should be tested by the analysis:

- Top-down decision making strategy must significantly predict positive effects of innovation in regression 1;
- Top-down decision making strategy must significantly predict importance of ideas from employees in regression 2;
- Importance of ideas from employees must significantly predict positive effects of innovation in regression 3;
- Top-down decision making strategy must predict Importance of ideas from employees less strongly in regression 3 than in regression 1.

The result of mediation analysis:

A mediation analysis was performed using the Baron and Kenny causal steps approach (full output in Appendix 12) (Field, 2013; Warner, 2013). A bias-corrected bootstrapping was used to conduct confidence interval for the indirect effect according procedures described by Hayes (2013). The initial causal variable was top-town decision making strategy, the outcome variable was positive effects of innovations, and the proposed mediator was importance of ideas from employees. Figure 11 represents the relationships in this mediation hypothesis. Results from preliminary data screening (Table 5), big sample size and usage of bootstrapping technique allow to assume that there was not any serious violation of necessary assumptions for mediation analysis. 95% confidence interval was used as a criterion for statistical significance.

All unstandardized regression coefficient obtained from the analysis' output are represented on the Figure 12. The results shows that the total effect from top-down decision making strategy on positive effects of innovations was significant $c=0.363$, $t(1924)=3.382$, $p<.001$. That indicates that top-down decisions increase positive effects of innovations. An influence form top-down decision making strategy on importance of ideas from employees was also significant, $a=0.105$, $t(1923)=3.365$, $p<.001$. Importance of ideas from employees significantly influenced positive effects of innovations while controlling for top-down decision making strategy, $b=0.378$, $f(1924)=4.442$, $p<.001$. The direct effect of top-down decision making strategy on positive effects of innovation was estimated as $c'=0.323$, $t(1923)=3.017$, $p=.003$. The estimated indirect effect was equal to $ab=0.040$. In order to judge about its significance, the bias-corrected bootstrap confidence interval (done with 10000 samples) was calculated and the Sobel test was conducted. The 95% bias-corrected bootstrap confidence interval ranges from 0.017 to 0.073. According the Sobel test, the indirect effect was significant $z=2.781$, $p=.005$. Completely standardized indirect effect was .008 BCa CI [.004, .015].

Based on the fact that coefficients a and b were statistically significant, the Sobel test was also significant and the bootstrap confidence interval for indirect effect did not include zero, we can assume that indirect effect from top-town decision making strategy on positive effects of innovations was statistically significant. Also, due to the fact that direct effect from top-down decision making strategy on positive effects of innovations was also significant, then the mediation effect can be characterized as partial. Goodness of fit for the model was $R^2=.172$ and means that 17.2% of variance in positive effects of innovations is accounted for by the model.

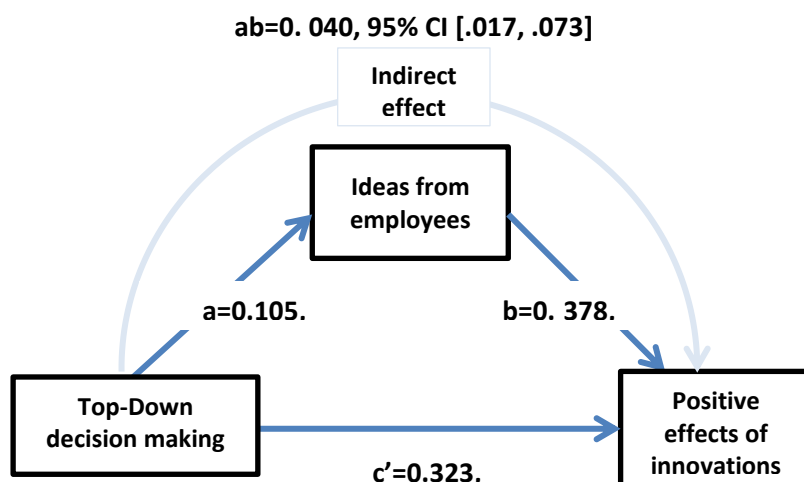


Figure 12. Mediation model with path coefficients for Hypothesis 6

Hypothesis 7

Hypothesis seven suggested that *environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of environment on positive effects of innovations.

Relationships supposed by the hypothesis can be represented in the next way (Figure 13):

1. Environment predicts importance of ideas from employees through the patch *a*;
2. Importance of ideas from employees predicts positive effects of innovations through the patch *b*;
3. An influence from environment on positive effects of innovation through the patch *c'* and moreover, it will be different when importance of ideas from employees (mediator) is also included in the model;
4. Basic relationship between environment and positive effects of innovation through the patch *c*.

Mediated Relationship

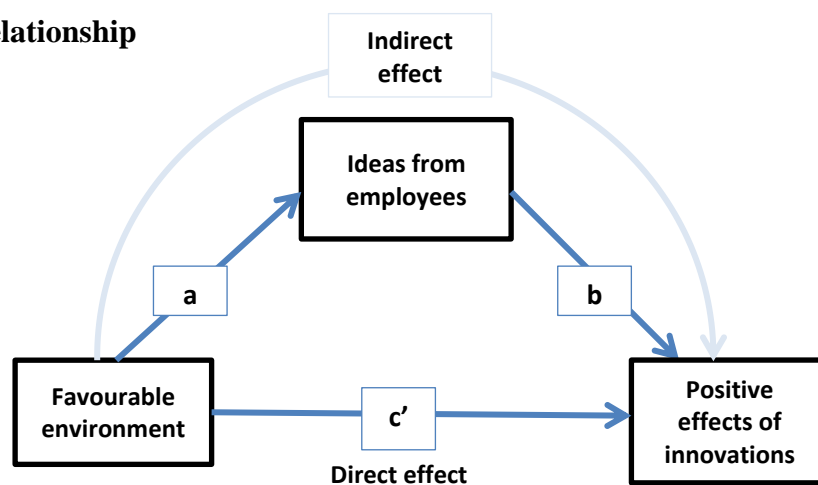


Figure 13. Model of environment as a predictor of positive effects of innovations, mediated by ideas from employees

However, as it can be seen from the (Figure 6; Table 5) there are also other variables that covariate and influence the mediator and the outcome. Such situation is represented in Figure 8. Thus, these variables should be included in the analysis as control variables.

The next three regression models should to be used according approach suggested by Baron and Kenny:

1. A regression predicting the positive effects of innovation (outcome) from the environment (predictor variable). The regression coefficient gives the value of c . This value represents the effect of predictor on outcome in the absence of mediator;
2. A regression predicting the importance of ideas from employees (mediator) from the environment (predictor variable). The regression coefficient gives the value of a ;
3. A regression predicting the positive effects of innovation (outcome) from both the environment (predictor variable) and importance of ideas from employees (mediator). The regression coefficient for environment gives the value of c' , the regression coefficient for importance of ideas from employees gives the value of b .

The values a , b , c , c' represent the unstandardized regression coefficients between variables and thereby, characterize the relations between them.

These are the necessary conditions of mediation in hypothesis seven that should be tested by the analysis:

- Environment must significantly predict positive effects of innovation in regression 1;
- Environment must significantly predict importance of ideas from employees in regression 2;
- Ideas from employees must significantly predict Positive effects of innovation in regression 3;
- Environment must predict Ideas from employees less strongly in regression 3 than in regression 1.

The result of mediation analysis:

A mediation analysis was performed using the Baron and Kenny causal steps approach (full output in Appendix 13) (Field, 2013; Warner, 2013). A bias-corrected bootstrapping was used to conduct confidence interval for the indirect effect according procedures described by Hayes (2013). The initial causal variable was environment, the outcome variable was positive effects of innovation, and the proposed mediator was importance of ideas from employees. Figure 13 represents the relationships in this mediation hypothesis. Results from preliminary data screening (Table 5. Bivariate regression analyses of the relationships between ideas from employees and positive effects of innovation), big sample size and usage of bootstrapping

technique allow to assume that there was not any serious violation of necessary assumptions for mediation analysis. 95% confidence interval was used as a criterion for statistical significance.

All unstandardized regression coefficient obtained from analysis' output are represented on the Figure 14. The total effect from environment on positive effects of innovation was significant $c=0.268$, $t(1924)=7.936$, $p<.001$. That indicates that favourable environment increases positive effects of innovations. However, its influence on importance of ideas from employees was insignificant, $a=-0.007$, $t(1924)=-0.773$, $p=.440$. Importance of ideas from employees significantly influence positive effects of innovations while controlling for environment, $b=0.378$, $f(1923)=4.442$, $p<.001$. The direct effect of environment on positive effects of innovation was estimated as $c'=0.271$, $t(1923)=8.051$, $p<0.001$. The estimated indirect effect was equal to $ab=-0.003$. In order to judge about its significance, the bias-corrected bootstrap confidence interval (done with 10000 samples) was calculated and the Sobel test was conducted. The 95% bias-corrected bootstrap confidence interval ranges from -0.011 to 0.004. According the Sobel test, the indirect effect was insignificant $z=-.744$, $p=.457$. Completely standardized indirect effect is $-.002$ BCa CI $[-.007 .003]$.

Based on the fact that coefficient a and the Sobel test were insignificant and the bootstrap confidence interval for indirect effect included zero, so we can assume that indirect effect from favourable environment on positive effects of innovations was not enough strong in order to be significant.

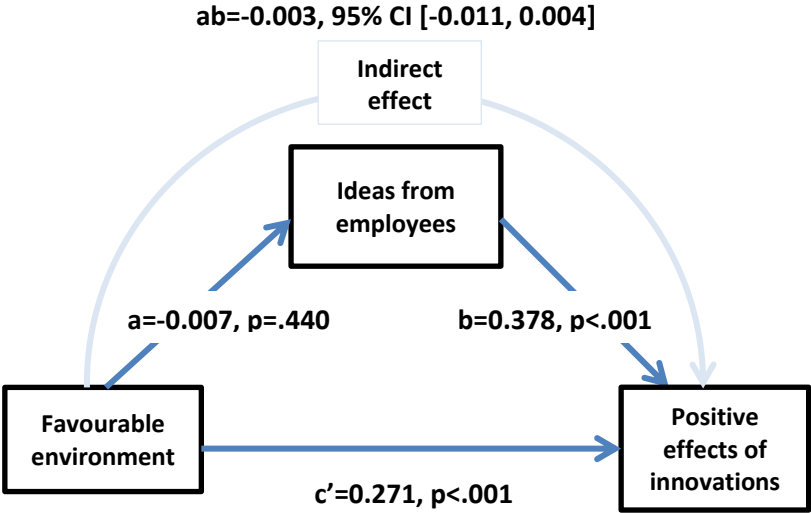


Figure 14. Mediation model with path coefficients for Hypothesis 7

Hypothesis 8

Hypothesis eight suggested that *barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees*. In other words, ideas from employees are expected to mediate the effect of barriers on positive effects of innovations.

Relationships supposed by the hypothesis can be represented in the next way (Figure 15):

1. Barriers predicts importance of ideas from employees through the patch *a*;
2. Importance of ideas from employees predicts positive effects of innovations through the patch *b*;
3. An influence from barriers on positive effects of innovation through the patch *c'* and moreover, it will be different when importance of ideas from employees (mediator) is also included in the model;
4. Basic relationship between barriers and positive effects of innovation through the patch *c*.

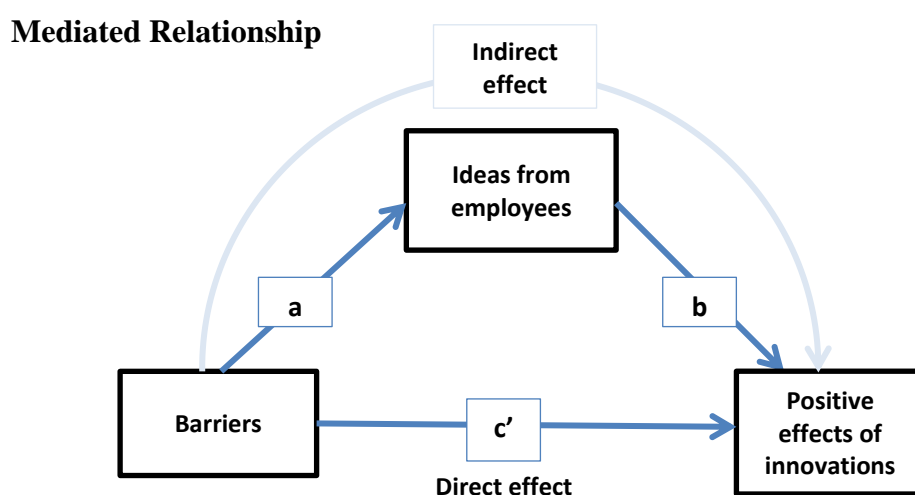


Figure 15. Model of barriers as a predictor of positive effects of innovations, mediated by ideas from employees

However, as it can be seen from the (Figure 6; Table 5) there are also other variables that covariate and influence the mediator and the outcome. Such situation is represented in Figure 8. Thus, these variables should be included in the analysis as control variables.

The next three regression models should to be used according approach suggested by Baron and Kenny:

1. A regression predicting the positive effects of innovation (outcome) from the barriers (predictor variable). The regression coefficient gives the value of c . This value represents the effect of predictor on outcome in the absence of mediator;
2. A regression predicting the importance of ideas from employees (mediator) from the barriers (predictor variable). The regression coefficient gives the value of a ;
3. A regression predicting the positive effects of innovation (outcome) from both the barriers (predictor variable) and importance of ideas from employees (mediator). The regression coefficient for barriers gives the value of c' , the regression coefficient for importance of ideas from employees gives the value of b .

The values a , b , c , c' represent the unstandardized regression coefficients between variables and thereby, characterize the relations between them.

These are the necessary conditions of mediation in hypothesis seven that should be tested by the analysis:

- Barriers must significantly predict positive effects of innovation in regression 1;
- Barriers must significantly predict importance of ideas from employees in regression 2;
- Importance of ideas from employees must significantly predict positive effects of innovation in regression 3;
- Barriers must predict Ideas from employees less strongly in regression 3 than in regression 1.

The result of mediation analysis:

A mediation analysis was performed using the Baron and Kenny causal steps approach (full output in Appendix 14) (Field, 2013; Warner, 2013). A bias-corrected bootstrapping was used to conduct confidence interval for the indirect effect according procedures described by Hayes (2013). The initial causal variable was barriers, the outcome variable was positive effects of innovation, and the proposed mediator was importance of ideas from employees. Figure 15 represents the relationships in this mediation hypothesis. Results from preliminary data screening (Table 5. Bivariate regression analyses of the relationships between ideas from employees and positive effects of innovation), big sample size and usage of bootstrapping technique allow to assume that there was not any serious violation of necessary assumptions for mediation analysis. 95% confidence interval was used as a criterion for statistical significance.

All unstandardized regression coefficient obtained from analysis' output are represented on the Table 8. Multiple regression analysis between incentives (H2), workforce skills (H3), education (H4) and ideas from employees (all three hypotheses are tested in one regression model).. The total effect from barriers on positive effects of innovation was insignificant $c=-0.109$, $t(1924)=-1.520$, $p=.129$. The result indicates that increase in barriers decreases the positive effects of innovations, but this effect was statistically insignificant on 95% confidence interval. It also insignificantly influenced importance of ideas from employees, $a=0.325$, $t(1923)=1.707$, $p=.088$. However, importance of ideas from employees significantly influenced positive effects of innovations while controlling for barriers, $b=0.378$, $f(1923)=4.442$, $p<.001$. The direct effect of barriers on positive effects of innovation was estimated as $c'=-0.121$, $t(2065)=1.699$, $p=.089$. The estimated indirect effect was equal to $ab=0.012$. In order to judge about its significance, the bias-corrected bootstrap confidence interval (done with 10000 samples) was calculated and the Sobel test was conducted. The 95% bias-corrected bootstrap confidence interval ranges from -0.260 to 0.019 . According the Sobel test, the indirect effect was significant $z=1.6$, $p=.119$. Completely standardized indirect effect is $.004$ BCa CI $[-.001, .010]$.

Based on the fact that coefficients a , c , c' and the Sobel test were statistically insignificant and the bootstrap confidence interval for indirect effect included zero, so we can assume that there was not statistically significant indirect effect from barriers on positive effects of innovations. The result also showed that the relationship between barriers and both importance of ideas from employees and positive effects of innovation was also insignificant (Figure 16). However, their significance values were not so far from $.5$ criterion. This values indicate that the effect was not big enough to be found (with 95% confidence interval) and does not says that the effect is zero and furthermore, in the bigger sample it would be deemed as statistically significant as it could be seen in testing hypothesis 2, 3 and 4 (Table 8. Multiple regression analysis between incentives (H2), workforce skills (H3), education (H4) and ideas from employees (all three hypotheses are tested in one regression model).) (Field, 2013).

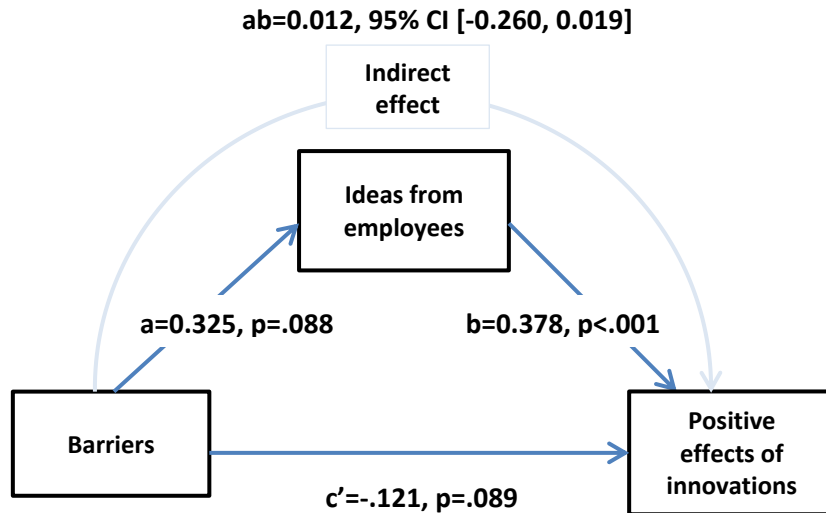


Figure 16. Mediation model with path coefficients for Hypothesis 8

5.5 Discussion

The present research project was aimed to investigate employee-driven innovation in the public sector by focusing on different theoretical perspectives concerning the factors fostering employees to innovate in the context of the public sector, i.e. the purpose of the work was to identify these factors, and moreover, to trace the innovation effect in the public sector and therefore, to answer the research questions.

For this reason, a model that comprises all these phenomena was developed (Figure 6). In order to connect all these components together and to check relations between them, eight hypotheses were conducted and tested through the analysis (Figure 9).

The proposed model helps to answer core questions of this work basing on the empirical data obtained from public sector organizations (Innobarometer survey). Through a sequence of different quantitative analyses it was possible to reveal how ideas from employees influence the innovative effect in the public sector and to find which factors had a significant effect on employee-driven innovation in public sector organizations.

Knowing answers on these questions will be possible to foster employee-driven innovation in order to encourage employees to suggest ideas for new products, services, processes and therefore increase performance of organization. Thus, performance and efficiency of the public sector lead to numerous benefits and social welfare. In theoretical part of this paper these features were discussed in great details.

The proposed hypotheses split the research into smaller steps and each of these steps was analysed and discussed further.

Table 9. Support status for the hypotheses

Hypothesis	Support status
Hypothesis 1: Ideas from employees as a source of information positively influence on public sector innovation.	Supported
Hypothesis 2: Incentives for employees increase importance of their ideas for innovation development.	Supported
Hypothesis 3: Workforce skills positively influence importance of employees' ideas for innovation development.	Supported
Hypothesis 4: Education positively influences importance of employees' ideas for innovation development.	Not supported
Hypothesis 5: Management support is expected to affect the size of positive effects of innovations through its effect on ideas from employees.	Supported
Hypothesis 6: Top-down decision making strategy is expected to affect the size of positive effects of innovations through its effect on ideas from employees.	Supported
Hypothesis 7: Environment is expected to affect the size of positive effects of innovations through its effect on ideas from employees.	Not supported
Hypothesis 8: Barriers are expected to affect the size of positive effects of innovations through its effect on ideas from employees.	Not supported

Hypothesis one stated that *ideas from employees as a source of information positively influence on public sector innovation*. This hypothesis was tested and supported through the multiple regression analysis. Control for other variables influencing on the outcome allowed improving the accuracy of the result. The result from the analysis suggests that organizations in the public sector with higher importance of employees as a source for innovation development are more effective in terms of innovations. This fact supports the theory that employees can be important source for innovation in the public sector.

Hypotheses two, three and four consider the influence of incentives, workforce skills and education on the ideas from employees (Figure 9). They suggested that the mentioned factors positively influence importance of employees' ideas for innovation development. These hypotheses were also tested through multiple regression analysis with control for other variables.

The result from the analysis supported hypothesis two and indicates that increase in incentives for employees lead to higher importance of employees' ideas for innovation development. Furthermore, this influence was the strongest comparing to other factors. Positive result of the hypothesis testing supports previous findings that incentives have a direct influence on employee-driven innovations (McAdam & McClelland, 2002; Mumford, 2000; Kesting and

Ulhøi, 2010). Innovation requires people who support and share the ideas and to encourage people to act like this, it is necessary to have a reward system that orients on the group of people, who generate these ideas and not just on individuals (Kesting & Ulhøi, 2010). Thus, a right reward system will be a strong driver for employees to generate new ideas and to participate in innovation development. As was mentioned by Halvorsen et al. (2005) it is important to consider differences between innovation in the private and the public sectors. And as the main mismatch lies in incentives and motivation, it is necessary to take this fact into account while developing such system. In theoretical part of the paper different types of incentives, their importance and their issues for the public sector were broadly discussed.

The result from analysis supports the hypothesis three as well, and consequently it supports the idea that more skilled employees are more important as a source of information for innovation. Human capital is particularly important for the public sector, because workforce skills are considered as key driver for innovations (Thenint, 2010). It is not enough to provide training concerning only idea realization phase. The initial step is to stimulate innovative ideas in order to create ground for further implementation. As was already mentioned by McAdam & McClelland (2002) and Mumford (2000), that essential innovation ideas come from the employees' skills. Organization should provide continuous training for its employees in order to develop necessary skills. Contribution to human capital and development of employees' potential will increase their potential for innovation development.

The influence of education on innovation ideas is not clear. The regression analysis indicates that amount of employees with university degree insignificantly influence importance of employees' ideas for innovation development. The ambiguous effect of education was discussed in the theoretical part of this paper. Employees with high education much more likely will generate good innovation ideas, than without it. However, from the other side, more creative and "crazy" ideas come from less educated people. It is so, because they do not have this schoolroom information, which limited innovation thinking. Innovation ideas that come from employees without high education could be very significant, because they less prone to patterns' thinking based on science. Based on expertise of "outside" world relevant of the study person can come up with new ideas how to change something. However the ideas have to be controlled by well-educated employees in order to develop these ideas in proper direction. The higher the education the more deeply people understand the nuances of working tasks. That is actually good, because person should be aware of how a particular

process works in order to find a new solution to solve it. The problems usually are solved based on scientific and theoretical knowledge from university. And this regime oppressed creative thinking of employees (Simone, 1968). Thus, the present analysis does not reveal neither positive nor negative significant effect of education on importance of employees' ideas for innovation development.

In the hypotheses five, six, seven and eight stated that there is a mediation effect between factors and positive effects of innovations (Figure 9). It supposed that management support, top-down decision making strategy and favourable environment affect the size of positive effects of innovations through its effect on ideas from employees. The most commonly used method suggested by Baron and Kenny was applied to test these hypotheses (Field, 2013).

In a mediation analysis, researchers typically ask two questions: whether there is a statistically significant mediated path from predictor variable to outcome via mediator variable; and whether there is also a significant direct path from predictor variable to outcome (Warner, 2013). Thus, the same questions were answered through testing the last four mediation hypotheses.

Hypotheses five (Figure 9) suggested that *ideas from employees are expected to mediate the effect of management support on positive effects of innovations*. From the performed analysis it can be concluded that the proposed model is consistent with the data. This follows from the fact that the model fulfils necessary requirements explained in the empirical part. The analysis showed that the indirect effect takes place in this case. In other words, the influence from management support on positive effects of innovations through ideas from employees was strong enough in order to be significant, but small in size in general. Due to the fact that a direct effect from management support on positive effects of innovations was also significant, we can infer that the influence on the last was only partially mediated. In other words, there is also influence from management support on positive effects of innovations that was not mediated by ideas from employees. To summarize, we can describe all the effects as the following:

Management support positively influences both ideas from employees and positive effects of innovations. In turn, increase in importance of ideas from employees leads to additional growth in positive effects of innovations.

The findings are fully supported by the theory. Management support is essential part of the employee-driven innovation concept. Kesting and Ulhøi, 2010 and Borins (2006) identified it as one of the driver of employee participation to innovation. In previous researches it was shown that management support is very important for employee's motivation to innovate (Howell & Avolio, 1993; Mumford et al., 2002). In order to develop innovative ideas and to take part in innovation process, employees need the support (Amabile et al., 2004; Clegg et al., 2002). As it was also shown through the analysis, management support increases positive effects of innovations through supporting employees' ideas. Managers can play the role of mentor, supporting employees during the whole innovation process, starting from the idea-generation and its implementation. And at the same time, management support allows employees make step out of their defined role, allowing them to use some working time and resources in order to participate to innovation projects (Kesting and Ulhøi, 2010). Without this type of management support employees will rarely take the initiative to participate in innovation (Amabile et al., 2004). Therefore, the task for managers is to support the idea from employee and to help in transforming this idea to innovation.

Hypotheses six (Figure 9) suggested that *ideas from employees are expected to mediate the effect of top-down decision strategy on positive effects of innovations*. Results from the analysis showed that the proposed model is consistent with the data. This follows from the fact that the model fulfils necessary requirements explained during the analysis in the empirical part. Thus, it can be said that the indirect effect takes place in this case. In other words, the influence from top-down decision strategy on positive effects of innovations through ideas from employees was strong enough in order to be significant, but also can be characterized as small in size in general. Presence of a significant direct effect from top-down decision strategy on positive effects of innovations indicates that the influence on the last was only partially mediated. As in previous case, in other words, there is also influence from top-down decision strategy on positive effects of innovations that was not mediated by ideas from employees. Summing up, we can describe all the effects as the following:

Top-down decision strategy positively influences both importance of ideas from employees and positive effects of innovations. In turn, increase in importance of ideas from employees leads to additional growth in positive effects of innovations.

The obtained findings are consistent with the theory. Public sector organisations controlled by government and influenced by political decisions. Therefore, there is a conventional wisdom

that whatever public sector innovation occurs comes solely from the top (Wilson, 1989). The top leaders of the public sector are represented by ministers, secretaries, senior servants or other politicians. They have the authority to make decisions on upper level and usually their way to management the public sector is strictly hierarchical, so makes political and legislative factors become important when it comes to innovation in the public sector (Borins, 2002). For example, Borins (2002) shows the cases when a public administration unsympathetic to the mandates of some departments and wants this department to do as little as possible, so this department would definitely not develop new programs, even if there is initiatives to improve efficiency of the department. This unsympathetic mood can appear and suppress innovation if the goals of politicians and department are different. In order to introduce new programs and increase efficiency of the public services, politicians should support employees who come forward with ideas and support their realization. Thus, decisions on the top level can open the door for innovation in the public sector as well as close it in order to avoid risk.

Hypotheses seven (Figure 9) suggested that *ideas from employees are expected to mediate the effect of environment on positive effects of innovations*. Analysis of proposed model identified that it does not satisfy necessary requirements. Thus, the proposed model is regarded as inconsistent with the data. Analysis showed that the influence of environment on the ideas from employees was not enough big in order to be significant. As the necessary condition of mediation, it points out the absence of such effect. A small effect, or in another words, path coefficient, could occur because of sampling error or because the construct was not defined well due to the issue of usage a secondary data. A favourable environment can be assessed in many ways, including material and nonmaterial aspects. In order to encourage employees on innovation, organizations should have necessary infrastructure and provide facilities for their employees. Creation of favourable environment may include involvement of private firms, which can provide consultants and trainings for the public sector or provide the necessary technology for employees. It is also related to a feeling of security and actually important when employees assume responsibility for change and innovation. At the same time, a favourable environment is concerned with work life traditions and marked conditions that may influence whether, and how, employees are involved in innovation (Amundsen et al, 2014). In order to force employees innovate in a continuous, sustainable and a long-term way it is not enough just resources and technical support but working environment with culturally embedded understanding and appreciation of innovation with such treats as nimble, responsive, exploratory and creative (Shah, 2011). However, the construct of favourable

environment in this paper mostly reflects the technical side of environment due to that the source of information was limited by the secondary data, i.e. by data obtained in the survey.

Despite the fact that the hypothesis was not supported, the direct effect of favourable environment on positive effects of innovations was positive and significant. Furthermore, a size of this effect is very strong comparing to the other factors.

The last hypothesis (Figure 9) suggested that *importance of ideas from employees is expected to mediate the effect of barriers on positive effects of innovations*. Analysis of proposed model identified that it also does not satisfy necessary requirements. Analysis showed that the influence of barriers both on the ideas from employees and positive effects of innovation was not big enough in order to be significant. As a necessary condition of mediation, it indicates the absence of such effect. As in the previous hypothesis, a small path coefficient could occur because of sampling error or because the construct was not defined well due to the issue of usage a secondary data. Barriers for innovation can be defined and assessed in many ways. In the literature barriers to innovation particularly in the public sector have attracted attention of a number researcher, most likely due to different obstacles between the public and private sectors (Arundel & Hollanders, 2011). Such barriers as limited financial resources, risk-averse culture, regulatory requirements, lack of support and staff resistance were found in the works of many researchers (Thenint 2010; Mulgan & Albury 2003; Borins 2006; Koch & Hauknes 2005; Bloch 2011; European Commission 2011). Mulgan & Albury (2003) highlight risk-aversion and staff resistance as the most important obstacles. The public sector tends to avoid a risk that makes an issue for public sector innovation (Bloch 2011). Furthermore, MacPherson (2001:2) suggests the main problem to public sector innovation is that the failure of can lead to much higher cost than the benefits of success. Hartley (2005) sees the main problem in political leaders and managers unlikely to support innovative ideas, which results in a risk-averse culture and non-innovating public sector. Therefore, it can be hardly possible to account for every possible obstacle in the construct. Moreover, barriers used in the paper were limited by the data obtained in the survey.

Despite the fact that the hypothesis was not supported, the significance of barriers' effects on positive effects of innovations and importance of ideas from employees were not so far from .5 criterion. It indicates that the effects were not big enough to be found (with 95% confidence interval) and do not says that the effect were zero and furthermore, in the bigger sample it would be deemed as statistically significant (Field, 2013).

It is important to sum up empirical findings and to make certain conclusions about them. First of all, empirical analysis showed that organizations in the public sector in which employees significantly contribute to innovations had more positive effects of innovations than organizations where employees were not used as a source of information for innovation development. This fact demonstrates that employees are an important source for innovation in the public sector. Thus, it makes sense for organizations to support this source of knowledge and ideas. For this purpose, the present paper specified and estimated factors influencing it.

The strongest impact on ideas from employees had incentives and management support and thus, organizations should pay a great attention to these factors. It leads to the particular importance of having a right reward and motivation systems in order to encourage people generate, share and support their ideas. Managers, in turn, should help to soften the rigid framework within highly hierarchical and inflexible public sector organizations in order to allow employees to make step out of their defined role. And of course, they should support employees in their initiatives. Moreover, it was discovered that employees become even more important as a source of innovation when public organizations face barriers.

Other important insights derived from the paper were about positive effects of innovations. It was shown that management support and top-down decisions directly influence effect of public sector innovations, as well as through influencing employees. It means that top-down decisions increase importance of ideas from employees and thereby, gain additional growth in positive effects of innovations. At the same time, managers can contribute also to positive effects of organization's innovations by supporting employees.

These insights can contribute to public sector organization to focus on important factors in order to foster employee-driven innovation and to get better performance from it. At the same time, the ideas gained from the thesis contribute to the theory of employee-driven innovation in the public sector by clarifying and estimating relations within it.

6. Conclusion and implication

The present research project has investigated employee-driven innovation in the public sector by focusing on different theoretical perspectives and analysis concerning the factors fostering employees to innovate in the context of the public sector. The postulated research question is addressed to investigate the influence of ideas from employees on the innovation effect in the public sector first and then to reveal factors affecting employee-driven innovation and the subsequent innovation effect among public sector organizations. The purpose of the work is to identify these factors, and moreover, to trace the innovation effect in the public sector. Thus, the research question was formulated as: *“How ideas from employees influence the innovative effect in the public sector and what factors affect employee-driven innovation in public sector organizations?”*

In order to answer the research question and to form the knowledge base for further research the concepts of innovation, EDI and the public sector have been broadly discussed. At the beginning of the work different approaches to define the public sector were introduced. It has been shown that the approaches of the definition differ depending on the case study, goals that have been set and the research objectives. Due to avoid misconceptions, the most encompassing definition of the public sector and notion of innovation was clearly formulated through supported discussion. The latter part of the first section has combined two these concepts and talks about phenomenon “innovation in the public sector”. Here the importance of innovation in the public sector for economy and society has been highlighted. Also innovation’s classification, types, source, factors determining how innovations occur and the complexity of innovations diffusion within the sector were discussed.

At the first parts of the second section the definition and different aspects of the general employee-driven innovation concept have been discussed. The human capital has been characterized as a powerful and important long-term organizational resource and it has been argued that organizations which utilize employee’s potential to innovate are more competitive and innovative in the market (Kesting & Ulhøi, 2010).

The latest parts of the second section have described the factors influencing on employee-driven innovation, particularly on ideas from employees and on innovation effect in the public sector. The factors, using in our investigation, were derived mainly based on the work of Kesting and Ulhøi (2010) about “grand structure” of employee-driven innovation. However,

they were supplemented by several other factors, which have a potential influence on EDI according to other research. All in all, there were identified seven factors: incentives, workforce skills, education, management support, top-down decision making strategy, favourable environment and barriers. Through the analysis of literature it was revealed that ideas from employees influence innovation effect in the public sector. Some of the factors have a direct impact on the formation of employees' innovation ideas, while other factors influence on innovation effect in the public sector through affecting ideas from employees. This observation led us to create a new model of employee-driven innovation in order to investigate the innovation effect in the public sector and factors influencing both of them.

Based on the theory and the purpose of our work eight hypotheses were developed to test the research model. The analysis revealed the positive innovation effect coming from the employees' ideas. Further, the analysis indicates that factors such as incentives and workforce skills have a direct positive impact on ideas from employees. Thus, the higher incentives and employees' workforce skills the more important ideas from employees as a source of information for innovation development will be. However, it has been found that education have no significant influence on employees' ideas. It was revealed that management support and top-down decision making strategy positively influence both ideas from employees and innovation effect. In turn, an increase in the importance of employees' idea leads to additional growth of positive effect from innovation thereby indicating the presence of partial mediation. In contrast, favourable environment had direct and significant influence only on innovation effect in the public sector. Particularly, favourable environment positively influences innovation effect, while the increase in barriers makes ideas from employees more important as source for innovation development.

Thus, the following answers to the research question "*How ideas from employees influence the innovative effect in the public sector and what factors affect employee-driven innovation and innovation effect in public sector organizations?*" were received:

- 1) Ideas from employees positively influence innovation effect in public sector organizations - this fact demonstrates that employees are an important source for innovation in the public sector.
- 2) Factors such as incentives, workforce skills, management support, top-down decision making strategy, and barriers were identified as influencing employee-driven innovation. Factors as management support, top-down decision making strategy and favourable

environment were determined as influencing innovation effect in the public sector – Therefore the factors management support and top-down decision making strategy influencing both constructs: employee-driven innovation and innovation effect in the public sector. Moreover, they contribute to innovation effect through affecting employees' ideas as well.

Conclusively, this project work combines the academic and research data from the most relevant authors and ends up with testing of the new developed model of employee-driven innovation in the public sector. The model shows the relationship between ideas from employees and innovation effect; and factors affecting these two components. Since the investigation was focusing mostly on the external factors, the recommendation for further research is to investigate more personal threats and characteristics influencing the employee-driven innovation.

The obtained results contribute to the theory of employee-driven innovation in the public sector. It could be used to explain factors affecting employee-driven innovation and the relationship between ideas from employees and innovation effect in order to increase performance of the public sector. This paper can be helpful for police formulation and strategies conducted in the public sector. The research effort on the factors influencing employee-driven innovation and innovation effect can be very useful for managers and other leaders in developing innovation in public organizations.

6.1 Limitations of the research

The current master thesis has some limitations that necessary to note for better understanding and clear picture of the obtained results. These limitations can form the basis for further research.

Employee-driven innovation and innovation in the public sector are two broad topics which were combined and addressed in the master thesis. Thus, the postulated hypotheses depend on two conditions, which are important to be noted.

First of all, the data for empirical analysis will be taken from the Innobarometer survey on innovation in the public sector 2010. The survey was developed collaboratively between MERIT, Gallup group and the European Commission and conducted in Norway, Switzerland and in the 27 EU Member States (European Commission, 2011). All in all, the Innobarometer comprises 3,699 responses from public organizations (Arundel & Hollanders, 2011).

Secondly, the results of the research will be suitable only for the public sector in EU, Norway and Switzerland since the data are limited to European public organizations (European Commission, 2011). Therefore, the research will focus on employee-driven innovation among European public sector organizations (including Norway and Switzerland).

Other limitations concern methodological part and occurred during the implementation of IB in the work.

One of the main limitations of the master thesis is the constructs applied in the research (ideas from employees, innovation effect, incentives, workforce skills, education, management support, top-down decision making strategy, favourable environment and barriers). All of them have not been empirically validated and were specifically developed for the current investigation. In chapter 4 it has been mentioned that the Innobarometer questionnaire, which is underlying the master thesis, was not developed specifically for the purpose of this investigation. In this regard, new constructs were drawn by choosing relevant items. This aspect may cause validity issue. Therefore, reliability and validity of the research were increased by using factor analysis. However, the usage of a single factor analysis may create a bias. Thus, further research may also use other techniques like chi-square and goodness of fit in order to limit this bias.

As was suggested by Warner (2013), nonexperimental data used to estimate the strength of relationship for the paths cannot prove causal hypotheses. With nonexperimental data it is possible only to test whether a hypothesized causal model is consistent or inconsistent with a particular causal model. In other words, statistically significant and large enough in magnitude path coefficient between two variables not proof of a causal connection, but shows that this result is consistent with the possibility that one might cause another (Warner, 2013).

It is also suggested that a single mediation analysis provides only preliminary nonexperimental evidence to evaluate whether the proposed causal model is plausible and replication of results increases confidence that findings are not due to sampling error (Warner, 2013).

In addition, some limitations occur during the implementation of IB. Limitations of IB survey mainly concern sample and comparability issues. These limitations were identified according to Innobarometer report 2010 (European Commission, 2011:6).

The first one is limited sampling resources. Sample was selected randomly from each country through the most complete lists of public institutions and starts from organizations with at least 10 employees (European Commission, 2011).

Another limitation applies comparability issues across countries. Comparison between countries becomes difficult due to sample frames. A number of country-specific factors may influence on innovation activity in the public sector. It is very difficult to consider and address all these factors with sampling (European Commission, 2011).

Important to notice, that IB results are only suitable for broad assessment of innovation performances in EU27 public sector. This refers to country comparison sample size limitation. For instance, there are many cases, when sample size lower than 50 responses per country. Therefore, the lack of statistical solidity leads to not reliable comparison of the results across Member States countries (European Commission, 2011).

The IB questionnaire limits sectorial comparisons since the question about area of responsibility allow choosing up to three activities. Many organizations participating the interview ascertain more than three areas served and, therefore, their choice of responsibility can be random. This creates overlap and the sectorial results do not too much differ from each other (European Commission, 2011).

The last limitation concerns stratification and weighting of the sample. Due to different nature of public organizations (number of employees, areas of responsibility etc.) and the lack of harmonized categorization, the country samples were not stratified. In other words, it means that organizations for interview were selected fully randomly. So, the results do not need to be weighted. The problem is that national sample size was determined in a uniform manner: partly from the country size and partly from available public organizations in the countries derived from sample frame. Thus, the size of the sample for each country is not proportionate. Therefore, the weight of national samples was made with a proxy: *the size of the general population in each country* (European Commission, 2011:7).

6.2 Further research

This master thesis could be a good basis for further research, considering different aspects of employee-driven innovation phenomenon in the public sector. Moreover, innovation effects in the public sector can also serve as a starting point for future investigations, since the current

work considered innovation effect as the sum of different effects and not in terms of strength of one single effect.

Target audience of IB survey were represented by senior managers responsible for strategic planning or decision making (by Executive Directors in bigger organizations and by Chief Executive for smaller ones). Thus, one of the suggestions is to repeat the current research by interviewing respondents from different departments and with different job positions in order to understand if the empirical findings are hold in the public sector under other conditions. It is particularly important to interview employees and managers at the middle level when investigating bottom-up approach to innovation. It is even probably better to conduct qualitative research with deep interview to know more about employee's innovative behaviour, stimuli and motivation of employee participation to developing innovations in a public organization.

Literature list

- Aho E (2005) Creating an Innovative Europe. Report of the group of independent experts on R&D and innovation appointed following the Hampton Court Summit.
- Altermatt, B., (2007). Reliability Analysis. Available:
<http://psych.hanover.edu/classes/ResearchMethods/Assignments/reliability-1.html>
[21.04.2015].
- Amabile, T. M., Schatzel, E. A., Moneta, G. B., & Kramer, S. J. (2004). Leader behaviors and the work environment for creativity: Perceived leader support. *The Leadership Quarterly*, 15(1), 5-32.
- Amabile, T.M.; Conti, R.; Coon, H.; Lazenby, J.; Herron, M. (1996) Assessing the work environment for creativity. *Academy of Management Journal*, 39(5): 1154-1185.
- Åmo, B. W. (2005). Employee innovation behavior (Doctoral dissertation).
- Amundsen, O., Aasen, T. M., Gressgård, L. J., & Hansen, K., (2014). Preparing organisations for employee-driven open innovation. *Int. Journal of Business Science and Applied Management*, 9(1).
- Anderson, J. C., & Gerbing, D. W., (1982). Some Methods for Respecifying Measurement Models to Obtain Unidimensional Construct Measurement. *Journal of Marketing Research*, 19, iss: 4, 453-460.
- Andriopoulos, C. (2001). Determinants of organisational creativity: a literature review. *Management decision*, 39(10), 834-841.
- Arundel, A., & Hollanders, H. (2011). A taxonomy of innovation: How do public sector agencies innovate? Results of the 2010 European Innobarometer survey of public agencies.
- Axtell, C.M., Holman, D.J., Unsworth, K.L., Wall, T.D., Waterson, P.E. and Harrington, E. (2000), "Shopfloor innovation: facilitating the suggestion and implementation of ideas", *Journal of Occupational & Organizational Psychology*, Vol. 73, pp. 265-85.
- Babbie, E., (2010). *The practice of social research*. 12th edition. Belmont CA: Wadsworth.
- Bakker, A. B., & Demerouti, E. (2008). Towards a model of work engagement. *Career development international*, 13(3), 209-223.
- Basadur, M. (2004). Leading others to think innovatively together: Creative leadership. *The Leadership Quarterly*, 15(1), 103-121.

- Bessant, J. R., (2003). High-involvement innovation: building and sustaining competitive advantage through continuous change. J. Wiley
- Bloch, C. (2011). Measuring public innovation in the Nordic countries (MEPIN).
- Blumberg, B., Cooper, D. R. & Schinder, P. R., (2008). Business research methods. London, McGraw Hill.
- Borins, S. (2001), "Encouraging innovation in the public sector", *Journal of Intellectual Capital*, 2:310 –319.
- Borins, S. (2002). Leadership and innovation in the public sector. *Leadership & Organization Development Journal*, 23(8), 467-476.
- Borins, S. (2006). The challenge of innovating in government. Arlington, VA: PricewaterhouseCoopers Endowment for the Business of Government.
- Bugge, M. M., Hauknes, J., Bloch, C., Slipersæter, S. (2010). The Public Sector in Innovation Systems: Module1 – Conceptual Framework. NIFU.
- Bugge, M., Mortensen, P. S., & Bloch, C. (2011). Report of the Nordic Pilot Studies– Analyses of methodology and results. Project–Measuring Public Innovation in the Nordic Countries: Toward a common statistical approach.
- Campbell, D., Campbell, S., 2008. Introduction to Regression and Data Analysis. StatLab Workshop Series.
- Clegg, C., Unsworth, K., Epitropaki, O., & Parker, G. (2002). Implicating trust in the innovation process†. *Journal of Occupational and Organizational Psychology*, 75(4), 409-422.
- Cohendet, P., & Llerena, P. (2003). Routines and incentives: the role of communities in the firm. *Industrial and corporate change*, 12(2), 271-297.
- Cowton, C. J. (1998). The use of secondary data in business ethics research. *Journal of Business Ethics*, 17(4), 423-434.
- Cronbach, L. J., (1951). Coefficient alpha and the internal structure of a test. *Psychometrika*, 16, 297-334.
- Dakhli, M., & De Clercq, D. (2004). Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & regional development*, 16(2), 107-128.
- De Simone, D. V. (1968). Education for innovation. *Spectrum, IEEE*, 5(1), 83-89.
- De Winter, J. C., & Dodou, D., (2012). Factor recovery by principal axis factoring and maximum likelihood factor analysis as a function of factor pattern and sample size. *Journal of Applied Statistics*, 39(4), 695-710.

- Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *Academy of management Review*, 20(1), 65-91.
- Easterby-Smith, M., Thorpe, R., and Jackson, P. (2012). *Management research*. Sage Publications.
- European Commission (2011), “Innobarometer 2010: Analytical Report Innovation in Public Administration, DG Enterprise, Brussels, Available: http://ec.europa.eu/public_opinion/flash/fl_305_en.pdf [21.04.2015].
- Edquist, C., Hommen, L., & Mckelvey, M. (2001), *Innovation and Employment: Process versus Product Innovation*. Edward Elgar Publishing.
- European Commission (2011), “Innobarometer 2010: Analytical Report Innovation in Public Administration, DG Enterprise, Brussels.
- Fagerberg, J., (2006). Innovation: a guide to the literature. In: Fagerberg, J., Mowery, D., Nelson, R. (Eds.), *The Oxford Handbook of Innovation*. Oxford University Press, Oxford.
- Feldman, M.S. (2003). A performance perspective on stability and change in organizational routines. *Industrial and Corporate Change*, 12, 727-52.
- Field, A., 2009. *Discovering statistics using SPSS*. 3rd edition. London: Sage Publications Ltd.
- Franz, M., & Lambert, R. (2008). Open and closed innovation: comparative analysis of national practices. *Forsyth*, 2 (3), 16-31.
- Gil-Garcia, J. R., Helbig, N., & Ojo, A. (2014). Being smart: Emerging technologies and innovation in the public sector. *Government Information Quarterly*, 31, 11-18.
- Golubeva, A. A., Sokolova, E. V. (2009). *Innovation in the public sector: Introduction to the issue*. Graduate School of Management, St. Petersburg State University.
- Gonzalez, R., Llopis, J., & Gasco, J. (2013). Innovation in public services: The case of Spanish local government. *Journal of Business Research*, 66(10), 2024-2033.
- Gumusluoglu, L., & Ilsev, A. (2009). Transformational leadership, creativity, and organizational innovation. *Journal of business research*, 62(4), 461-473.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E., (2010). *Multivariate Data Analysis*. 7th edition. New Jersey: Pearson Prentice Hall.
- Hallgren, E. (2008). *Employee driven innovation: A case of implementing high-involvement innovation*. Lyngby: Technical University of Denmark, Department of Management Engineering.
- Halvorsen, T., Hauknes, J., Miles, I., & Røste, R. (2005). *On the differences between public and private sector innovation*. Publin Report N. D9. NIFU STEP.

- Hartley, J. (2005). Innovation in governance and public services: Past and present. *Public money and management*, 25(1), 27-34.
- Hayes, A., (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.
- Herstein, R., & Mitki, Y. (2008). How El Al Airlines transformed its service strategy with employee participation. *Strategy & Leadership*, 36(3), 21-25.
- Hollanders, H. & Arundel, A. (2008). A taxonomy of innovation: How do public sector agencies innovate? Results of the 2010 European Innobarometer survey of public agencies. Maastricht: UNU-MERIT, Available: http://www.proinno-europe.eu/sites/default/files/page/11/12/IUS2010_A_taxonomy_of_innovation_How_do_public_sector_agencies_innovate.pdf [21.04.2015].
- Hollanders, H., Arundel, A., Buligescu, B., Peter, V., Roman, L., Simmonds, P., & Es-Sadki, N. (2013). *European Public Sector Innovation Scoreboard 2013*, European Commission—a pilot exercise.
- Howell, J. M., & Avolio, B. J. (1993). Transformational leadership, transactional leadership, locus of control, and support for innovation: Key predictors of consolidated-business-unit performance. *Journal of applied psychology*, 78(6), 891.
- Hox, J. J., & Boeije, H. R. (2005). Data collection, primary vs. secondary. *Encyclopedia of social measurement*, 1, 593-599.
- Hughes A, Moore K, and Kataria N (2011), ‘Innovation in Public Sector Organisations: A Pilot Survey for Measuring Innovation Across the Public Sector’, NESTA, London.
- Hurt, H., Joseph, K. and Cook, C. (1977), “Scale for the measurement of innovativeness”, *Human Communication Research*, Vol. 4, pp. 58-65.
- Ilvento, T., (2008). Module 5: Multiple Regression Analysis. Available: <http://www.udel.edu/FREC/ilvento/BUAD820/MOD504.pdf> [03.05.2015].
- Janssen, O. (2000), “Job demands, perceptions of effort-reward fairness, and innovative work behavior”, *Journal of Occupational & Organizational Psychology*, Vol. 73, pp. 287-302.
- Janssen, O. (2005). The joint impact of perceived influence and supervisor supportiveness on employee innovative behaviour. *Journal of occupational and organizational psychology*, 78(4), 573-579.
- Jong, J. P., & Hartog, D. N. (2007). How leaders influence employees' innovative behaviour. *European Journal of innovation management*, 10(1), 41-64.

- Kesting, P. (2007). Why innovations have to overcome routine. *History of Economic Ideas*, 15, 137-56.
- Kesting, P., & Ulhøi, J. (2008). Employee Driven Innovation: The Discovery of the Hidden Treasure. In Workshop of the European Network of the Economics of the Firm. Available at: <https://mail.sssup.it/~l.marengo/ENEffinal/Kesting.pdf> (accessed 12.04.2015).
- Kesting, P., & Ulhøi, J. P. (2010). Employee-driven innovation: extending the license to foster innovation. *Management Decision*, 48(1), 65-84.
- Khury, B., & Van der Torre, V. (2002). De vierde sector. The Hague: Social and Cultural Planning Office (research paper 2004/2005).
- Koch, P., Hauknes, J. (2005). On innovation in the public sector. Publin Report N. D20, NIFU.
- Kristopher, P., J. Preacher, K., Rucker, D., Hayes, A., (2007). Addressing Moderated Mediation. *Multivariate behavioral research*. Lawrence Erlbaum Associates, Inc.
- LO (2007) Employee-driven-innovation – a trade union priority for growth and job creation in a globalised economy.
- MacPherson, M., (2001). Performance Excellence Principles-Drivers of Innovation in Public Sector Organisations. In National Conference of the New Zealand Organisation for Quality, Christchurch Convention Centre, 31st May. Sweet, S., Grace-Martin, K., 2012. *Data Analysis with SPSS: A First Course in Applied Statistics*, 4th Edition, Pearson
- McAdam, R., & McClelland, J. (2002). Individual and team-based idea generation within innovation management: organisational and research agendas. *European Journal of Innovation Management*, 5(2), 86-97.
- Mirela, N. F. (2013). Approach Of Rdi System In European Union In The Last Decade. *Annals of Faculty of Economics*, 1(1), 499-508.
- Mulgan, G. and Albury, D. (2003), *Innovation in the Public Sector*, Strategy Unit, Cabinet Office, October.
- Mumford, M. D. (2000). Managing creative people: strategies and tactics for innovation. *Human resource management review*, 10(3), 313-351.
- Mumford, M. D., Scott, G. M., Gaddis, B., & Strange, J. M. (2002). Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly*, 13(6), 705-750.
- Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Harvard University Press.

- Nijhof, A., Krabbendam, K., & Looise, J. C. (2002). Innovation through exemptions: building upon the existing creativity of employees. *Technovation*, 22(11), 675-683.
- OECD, (2005). Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data. Eurostat, 3rd Edition, Available: <http://www.oecd.org/dataoecd/35/61/2367580.pdf> [23.05.2012].
- Osborne, S. P., & Brown, K. (2005). *Managing change and innovation in public service organizations*. Psychology Press.
- Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of management review*, 28(1), 89-106.
- Petkovšek, V., & Cankar, S. S. (2013). Public Sector Innovation in the European Union and Example of Good Practice. In *Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management, Knowledge and Learning International Conference 2013* (pp. 1329-1336). ToKnowPress.
- Scott, R. K. (1995). Creative employees: A challenge to managers. *The Journal of Creative Behavior*, 29(1), 64-71.
- Seltman, H., (2014). *Experimental Design and Analysis*, Carnegie Mellon University
- Shah, K. U., & Prokopec, K., (2011). *Organizational Transformation through Employee Driven Innovation: The Ontario Public Service Ideas and Innovation Program*. CAPAM Library of Public Administration Case Studies
- Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, 15(1), 33-53.
- Sundbo, J. (1999). Empowerment of employees in small and medium-sized service firms. *Employee Relations*, 21(2), 105-127.
- Teglborg-Lefèvre, A. C. (2010). Modes of approach to employee-driven innovation in France: an empirical study. *Transfer: European Review of Labour and Research*, 16(2), 211-226.
- Telljohann, V. (2010). Employee-driven innovation in the context of Italian industrial relations: the case of a public hospital. *Transfer: European Review of Labour and Research*, 16(2), 227-241.
- Thenint H., (2010). *Innovation in the Public Sector*. *Global Review of Innovation Intelligence and Policy Studies*, Available: http://grips-public.mediactive.fr/knowledge_base/dl/889/orig_doc_file/ [01.05.2015].

- Warner, R., (2013). *Applied statistics: from bivariate through multivariate techniques: from bivariate through multivariate techniques*, 2nd Edition. Sage.
- Wilson, J. Q. (1989). *Bureaucracy: What government agencies do and why they do it*. Basic Books. New-York, NY.
- Windrum, P., & Koch, P. M. (Eds.). (2008). *Innovation in public sector services: entrepreneurship, creativity and management*. Edward Elgar Publishing.
- Zaltman, G., Duncan, R. and Holbek, J. (1973), *Innovations and Organizations*, Wiley, New York, NY.
- Zhou, J. (2003). When the Presence of Creativity Cowokers is Relate to Creativity Role of Supervisor Close Monitoring, Developmental Feedback, and Creative Personality
- Zhou, J. (1998). Feedback valence, feedback style, task autonomy, and achievement orientation: Interactive effects on creative performance. *Journal of Applied Psychology*, 83(2), 261.

APPENDIX 1: Survey

Survey questionnaire “Innobarometer 2010 – public services innovation”

Organisation information

Please answer all questions for the organisation for which you are responsible. For example, if you are responsible for the regional office of a national organisation, only answer for your regional office.

Now let me start with a few basic questions on your organisation.

D1. How many employees does your organisation have?

READ OUT – ONE ANSWER ONLY

- Less than 10.....1 THANK AND TERMINATE
- Between 10 and 49 2
- Between 50 and 99 3
- Between 100 and 249 4
- Between 250 and 499 5
- Between 500 and 999 6
- 1000 or more 7
- [DK/NA]..... 9

D2. Is your organisation?

READ OUT – ONE ANSWER ONLY

- a) A government organisation or owned by the government 1
- b) A not for profit organisation which is independent from the government.....2
- c) A private sector organisation.....3

D3. Which of the following are part of your organisation’s main areas of responsibility? Select up to the three most representative activities for your organisation.

READ OUT – UP TO 3 ANSWERS

- a) General government activities or finance..... 1
- b) Education 2
- c) Health..... 3
- d) Social services..... 4
- e) Culture, sport or recreation..... 5
- f) Housing..... 6
- g) Environment..... 7

h) Other 9

D4. Which of the following best describes the geographic area served by the organisation where you work?

READ OUT – ONE ANSWER ONLY

Local 1
Regional..... 2
National..... 3

Section 1: Innovation

The next set of questions asks if your organisation has introduced, since January 2008, any innovations. An innovation is a new or significantly improved service, communication method, process, or organizational method.

Q1. Since January 2008, did your organisation introduce any new or significantly improved services?

ONE ANSWER ONLY

- Yes..... 1
- No 2
- [DK/NA]..... 9

[IF “NO” OR “DK/NA” GO TO Q5]

Q2. Were any of these services:

ONE ANSWER ONLY

New to the public administration in your country. 1
Only new to your organisation..... 2
[DK/NA]..... 9

Q3. Were any of these new or significantly improved services developed by:

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9

a) Your organisation together with other public sector organisations, including regional or national affiliates of your organisation.....1 2 9

- b) Your organisation together with private businesses.....1 2 9
- c) Your organization together with not-for-profit organisations.....1 2 9
- d) Your organisation by itself.....1 2 9
- e) Other organisations or businesses, with your organisation making no further changes or only minimal changes.....1 2 9

Q4 Please think of the different types of services provided by your organization in 2010. What percent of these are new or have been significantly improved since January 2008?

READ OUT – ONE ANSWER ONLY

- Less than 25%..... 1
- Between 25% and 49%..... 2
- Between 50% and 74%..... 3
- 75% or more..... 4
- [DK/NA]..... 9

Q5. Since January 2008, did your organisation introduce any new or significantly improved methods of communicating your activities to the public, such as ...?

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9

- a) New or improved methods of promoting your organisation or your services.....1 2 9
- b) New or improved methods of influencing the behaviour of users, citizens or others...1 2 9
- c) First time commercialisation (for sale) of services or goods.....1 2 9

Q6. Since January 2008, did your organisation introduce any new or significantly improved processes or organisational methods, such as ...?

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9

- a) New or improved methods of providing services or interacting with your users1 2 9
- b) New or improved delivery or logistics systems for your inputs.....1 2 9

- c) New or improved supporting activities such as maintenance systems, purchasing, accounting, or computing systems, etc1 2 9
- d) New or improved management systems1 2 9
- e) New or improved methods of organising work responsibilities or decision making.....1 2 9

[IF “NO” OR “DK/NA” TO ALL OPTIONS GO TO Q8]

Q7. Were any of these new or significantly improved processes or organisational methods developed by:

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9

- a) Your organisation together with other public sector organisations, including regional or national affiliates of your organisation.....1 2 9
- b) Your organisation together with private businesses.....1 2 9
- c) Your organization together with not-for-profit organisations.....1 2 9
- d) Your organisation by itself.....1 2 9
- e) Other organisations or businesses, with your organisation making no further changes or only minimal changes.....1 2 9

Section 2: Work force and skills

Q8. In 2010, approximately what percent of your organisation’s employees had a university degree?

READ OUT – ONE ANSWER ONLY

- 0%..... 1
- Between 1% and 9%..... 2
- Between 10% and 24%..... 3
- Between 25% and 49%..... 4
- Between 50% to 74%..... 5
- 75% or more..... 6
- [DK/NA]..... 9

Q9. What percent of your employees are currently involved in groups that meet regularly to develop new or significantly improved services, communication methods, processes or organisational methods?

READ OUT – ONE ANSWER ONLY

- None 1
- Less than 25% 2
- Between 25% and 49% 3
- Between 50% and 74% 4
- 75% or more..... 5
- [DK/NA]..... 9

Q10. Since January 2008, did your organization provide training for your employees specifically for implementing, using or providing ...?

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9

- a) New or improved services..... 1 2 9
- b) New or improved communication methods..... 1 2 9
- c) New or improved processes or organisational methods..... 1 2 9

Section 3: Effects of innovation

Q11. Have any of your new or significantly improved services, introduced since January 2008, had a major positive effect by:

READ OUT –ROTATE 1-5 - MULTIPLE ANSWERS POSSIBLE

- Enabling your organisation to offer services to more or new types of users.....1
- Enabling your organisation to better target its services.....2
- Improving user satisfaction.....3
- Improving user access to information4
- Enabling faster delivery of services.....5
- Other positive effect.....6
- [IF NONE OF 1-6 SELECTED] No positive effect7
- [DK/NA]..... 9

Q12. Have any of your new or significantly improved processes or organizational methods, introduced since January 2008, had a major positive effect by:

READ OUT –ROTATE 1-4 - MULTIPLE ANSWERS POSSIBLE

- Simplifying administrative procedures..... 1
- Reducing costs for providing services.....2
- Enabling faster delivery of services.....3
- Improving employee satisfaction or working conditions4
- Other positive effect.....5
- [IF NONE OF 1-5 SELECTED] No positive effect6
- [DK/NA]..... 9

Q13. Have any of your new or significantly improved services, processes or organizational methods, introduced since January 2008, had a sustained major negative effect by:

READ OUT – ROTATE - MULTIPLE ANSWERS POSSIBLE

- Creating additional administrative costs1
- Reducing the types or flexibility of your services2
- Leading to slower delivery of services3
- Creating user resistance or dissatisfaction4
- Other negative effect.....5
- [IF NONE OF 1-5 SELECTED] No negative effect6
- [DK/NA]..... 9

Section 4: Drivers and strategy

READ OUT: The next three questions refer to all of the innovations introduced by your organisation since January 2008. These include your new or significantly improved services, communication methods, processes, or organisational methods.

Q14. Since January 2008, how important were the following information sources for the development of your innovations?

READ OUT – ONE ANSWER PER LINE

- No important..... 1
- Somewhat important..... 2
- Very important..... 3

- [DK/NA].....	9
a) Ideas from management	1 2 3 9
b) Ideas from staff.....	1 2 3 9
c) Examples of best practice by another government organisation	1 2 3 9
d) Professional organisations.....	1 2 3 9
e) Visits to conferences	1 2 3 9
f) Enterprises as suppliers.....	1 2 3 9
g) Enterprises as clients or users.....	1 2 3 9
h) Citizens as clients or users	1 2 3 9

[IF “MEDIUM” OR "HIGH" TO OPTIONS c), d), e), f) OR g) THEN GO TO Q15 OTHERWISE GO TO Q16]

Q15. Since January 2008, did you obtain information essential to your innovations from any of the following sources?

READ OUT – ONE ANSWER PER LINE

- Yes.....	1
- No	2
- [DK/NA].....	9
a) An organisation, enterprise or event in your country	1 2 9
b) An organisation, enterprise or event in another European Union country.....	1 2 9
c) An organisation, enterprise or event outside the European Union	1 2 9
d) A European Commission organisation or event.....	1 2 9

Q16. How important were the following political or legislative factors in driving the development and introduction of your innovations since January 2008?

READ OUT – ONE ANSWER PER LINE

- Low	1
- Medium.....	2
- High	3
- [DK/NA].....	9
a) Mandated decrease in your organisation’s budget.....	1 2 3 9
b) Mandated increase in your organisation’s budget.....	1 2 3 9
c) New laws or regulations	1 2 3 9
d) New policy priorities	1 2 3 9

e) Mandated introduction of new e-government or online services.....1 2 3 9

Q17. How well do the following apply to your organisation since January 2008?

[IF ALL ANSWERS TO QUESTION Q1, Q5, and Q6 ARE “NO” OR “DON’T KNOW” ONLY ASK QUESTIONS 17a and 17c]

READ OUT – ONE ANSWER PER LINE

- Not at all 1
- Partly..... 2
- Fully 3
- [DK/NA]..... 9

- a) Managers support trial-and-error testing of new ideas.....1 2 3 9
- b) Managers takes an active role in developing and implementing innovations1 2 3 9
- c) Staff have incentives to think of new ideas and take part in their development.....1 2 3 9
- d) Users are involved in the design or planning of new or improved services1 2 3 9
- e) New or improved services are evaluated after completion.....1 2 3 9

Section 5: Barriers

Q18. Since January 2008, how important were the following factors in preventing or delaying your organization’s efforts to develop or introduce new or significantly improved services, communication methods, processes or organisational methods?

READ OUT – ONE ANSWER PER LINE

- Not important..... 1
- Low importance 2
- Medium importance 3
- High importance 4
- [DK/NA]..... 9

- a) Lack of management support1 2 3 4 9
- b) Lack of incentives for your staff1 2 3 4 9
- c) Staff resistance.....1 2 3 4 9
- d) Uncertain acceptance by the users of your services.....1 2 3 4 9
- e) Regulatory requirements1 2 3 4 9
- f) Lack of sufficient human or financial resources.....1 2 3 4 9
- g) Risk adverse culture in your organisation.....1 2 3 4 9

Section 6: Procurement

Q19. Since January 2008, did your organisation put out tenders to private businesses to provide any of the following goods and services?

READ OUT – ONE ANSWER PER LINE

- Yes..... 1
- No 2
- [DK/NA]..... 9
- a) ICT equipment or systems1 2 9
- b) Technologies or services to improve environmental or energy performance1 2 9
- c) Other types of technology1 2 9
- d) Consulting to recommend, design or pilot test new or improved services.....1 2 9
- e) R&D for new technologies and services1 2 9
- f) Provide one or more services to your users1 2 9

[IF “NO” OR “DK/NA” TO ALL OPTIONS GO TO QUESTION 23]

Q20. Prior to publishing tenders does your organisation usually consult with ...?:

READ OUT – MULTIPLE ANSWERS POSSIBLE

- Potential suppliers/ contractors..... 1
- The users of your services..... 2
- Other organisations conducting similar procurements 3
- Other organisations providing specialist advice 4
- [DK/NA]..... 9

Q21. For an applicant to be successful in a tender from your organisation do you consider that...

READ OUT – ONLY ONE ANSWER

- ...low cost is more important than innovation for winning the tender 1
- ...innovation is more important than low cost for winning the tender 2
- ...cost and innovation have equal importance for winning the tender..... 3
- DK/NA 9

Q22. Did any of your tenders since January 2008 obtain the following results?

READ OUT – MULTIPLE ANSWERS POSSIBLE

- Introduce a new or significantly improved service provided by or for your organisation.....1
- Significantly reduce the costs of providing existing services.....2
- Significantly reduce the environmental impacts of your services3

Section 7: Expected developments in the next two years

Q23. Over the next two years, do you expect any of the following factors to have a positive or negative impact on the ability of your organisation to introduce new or significantly improved services?

READ OUT – ONE ANSWER PER LINE

- Positive impact 1
- Negative impact..... 2
- No impact 3
- [DK/NA]..... 9
- a) Mandated decrease in your organisation’s budget.....1 2 3 9
- b) Mandated increase in your organisation’s budget.....1 2 3 9
- c) New laws or regulations1 2 3 9
- d) New policy priorities1 2 3 9
- e) Increasing demand from citizens1 2 3 9
- f) Introduction of new technologies1 2 3 9

Q24. Compared to the period between 2008 and 2010, do you expect the number of innovations introduced by your organisation over the next two years to increase, decrease, or remain unchanged?

READ OUT – ONE ANSWER PER LINE

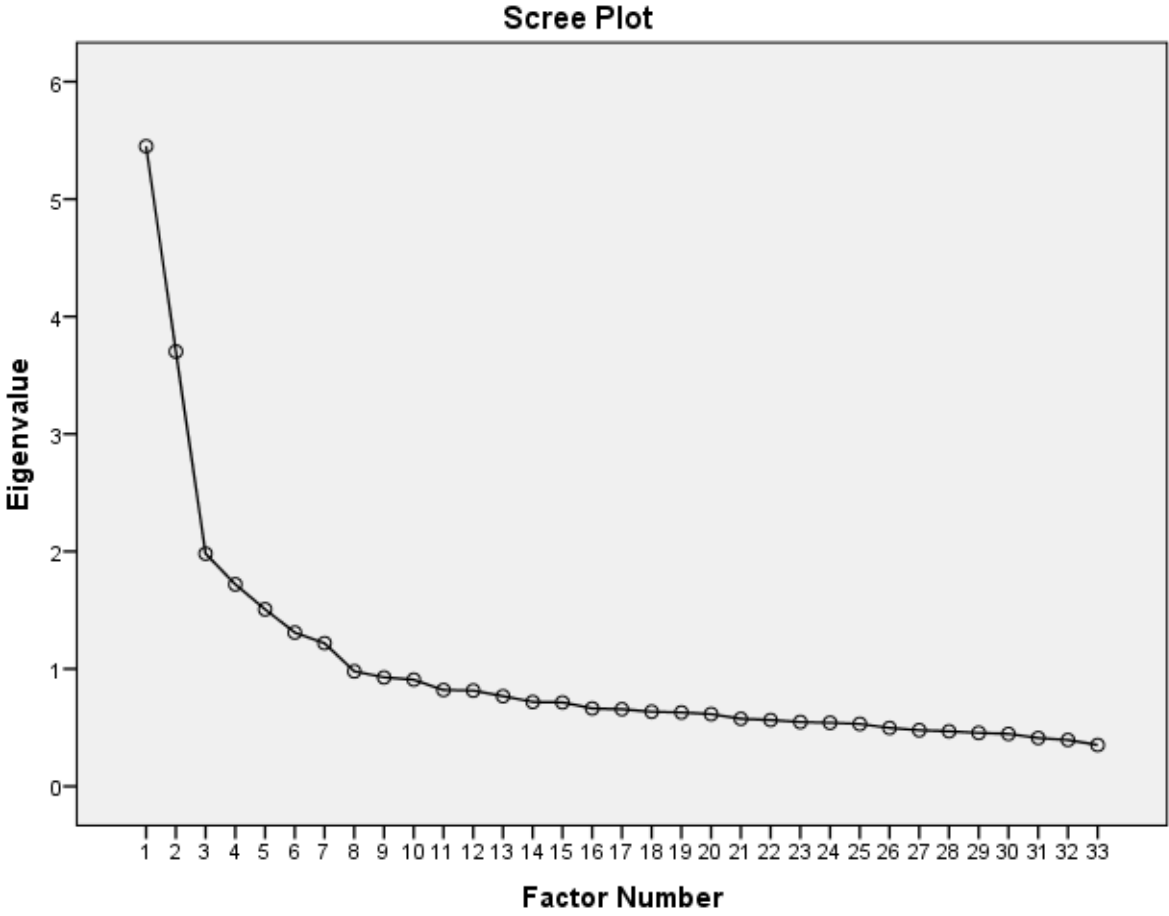
- Increase..... 1
- Decrease 2
- Remain the same 9
- a) Number of new or significantly improved services1 2 9
- b) Number of new or significantly improved communication methods1 2 9
- c) Number of new or significantly improved processes or organisational methods1 2 9

APPENDIX 2: Total Variance Explained by factors

Factor	Total Variance Explained					
	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,450	16,516	16,516	3,277	9,930	9,930
2	3,702	11,219	27,736	2,766	8,382	18,312
3	1,981	6,002	33,738	2,006	6,078	24,390
4	1,720	5,211	38,949	1,645	4,984	29,374
5	1,507	4,567	43,516	1,402	4,250	33,623
6	1,309	3,968	47,484	,965	2,925	36,549
7	1,219	3,694	51,177	,897	2,719	39,268
8	,979	2,967	54,144			
9	,928	2,811	56,954			
10	,908	2,752	59,707			
11	,820	2,486	62,193			
12	,815	2,471	64,664			
13	,768	2,326	66,990			
14	,719	2,178	69,168			
15	,714	2,164	71,332			
16	,663	2,010	73,342			
17	,656	1,989	75,331			
18	,635	1,925	77,256			
19	,629	1,908	79,163			
20	,615	1,864	81,027			
21	,575	1,742	82,769			
22	,564	1,710	84,479			
23	,548	1,659	86,138			
24	,541	1,639	87,777			
25	,531	1,609	89,386			
26	,497	1,505	90,892			
27	,478	1,448	92,340			
28	,468	1,419	93,759			
29	,455	1,379	95,138			
30	,447	1,353	96,491			
31	,412	1,247	97,739			
32	,395	1,196	98,935			
33	,352	1,065	100,000			

Extraction Method: Principal Axis Factoring.

APPENDIX 3: Scree Plot



APPENDIX 4: Full output of reliability analysis

Scale: Barriers

Case Processing Summary

		N	%
Cases	Valid	3187	86,2
	Excluded ^a	512	13,8
	Total	3699	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,860	,859	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q18_a. Lack of management support	10,13	22,472	,663	,485	,835
Q18_b. Lack of incentives for your staff	10,07	23,092	,676	,502	,833
Q18_c. Staff resistance	10,22	22,994	,687	,500	,832
Q18_d. Uncertain acceptance by the users of your services	10,18	23,463	,663	,452	,835
Q18_e. Regulatory requirements	9,74	24,260	,565	,340	,849
Q18_f. Lack of sufficient human or financial resources	9,41	25,436	,507	,277	,856
Q18_g. Risk-averse culture in your organisation	10,13	23,795	,626	,402	,840

Scale: Positive effect of innovation

Case Processing Summary

		N	%
Cases	Valid	3168	85,6
	Excluded ^a	531	14,4
	Total	3699	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,733	,664	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q11_1. Enabling your organisation to offer services to more or new types of users	5,36	5,032	,408	,184	,709
Q11_2. Enabling your organisation to better target its	5,27	4,840	,532	,294	,689
Q11_3. Improving user satisfaction	5,18	5,108	,443	,222	,704
Q11_4. Improving user access to information	5,12	5,226	,426	,210	,707
Q11_5. Enabling faster delivery of services	5,27	4,850	,524	,367	,691
Q11_6. Other positive effect	5,88	6,289	-,150	,182	,751
Q12_1. Simplifying administrative procedures	5,25	5,055	,428	,210	,706
Q12_2. Reducing costs for providing services	5,39	5,025	,408	,191	,709
Q12_3. Enabling faster delivery of services	5,25	4,882	,517	,375	,692

Q12_4. Improving employee satisfaction or working conditions	5,27	5,129	,380	,171	,714
Q12_5. Other positive effects	5,87	6,330	-,184	,203	,755

Scale: Favourable environment

Case Processing Summary

		N	%
Cases	Valid	3279	88,6
	Excluded ^a	420	11,4
	Total	3699	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,763	,765	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q19_a. ICT equipment or systems	1,37	1,913	,519	,274	,726
Q19_c. Other types of technology	1,52	1,934	,521	,276	,724
Q19_d. Consulting to recommend design or pilot test new or improved services	1,57	1,938	,546	,312	,715
Q19_e. R&D for new technologies and services	1,70	2,105	,516	,280	,728
Q19_f. Provide one or more services to your users	1,46	1,864	,565	,320	,708

Scale: Top-Down decision making strategy

Case Processing Summary

		N	%
Cases	Valid	2618	70,8
	Excluded ^a	1081	29,2
	Total	3699	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,684	,686	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q16_a. Mandated decrease in your organisation's budget	4,51	4,618	,430	,213	,638
Q16_b. Mandated increase in your organisation's budget	4,79	4,697	,404	,193	,650
Q16_c. New laws or regulations	4,27	4,608	,518	,292	,601
Q16_d. New policy priorities	4,43	4,732	,451	,241	,628
Q16_e. Mandated introduction of new e-government or online services	4,38	4,857	,395	,176	,652

Scale: Workforce skills

Case Processing Summary

		N	%
Cases	Valid	3226	87,2
	Excluded ^a	473	12,8
	Total	3699	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,749	,750	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q10_a. New or improved services	1,44	,606	,579	,336	,666
Q10_b. New or improved communication methods	1,52	,537	,588	,347	,652
Q10_c. New or improved processes or organisational methods	1,51	,553	,566	,320	,678

Scale: Management support

Case Processing Summary

		N	%
Cases	Valid	3149	85,1
	Excluded ^a	550	14,9
	Total	3699	100,0

- a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,665	,665	2

APPENDIX 5: Full output for bivariate regression analysis of Hypothesis 1

Descriptive Statistics

	Mean	Std. Deviation	N
Positive effects of innovation	5,85	2,524	3212
Ideas from employees	1,37	,629	3273

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Ideas from employees ^b	.	Enter

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,211 ^a	,045	,044	2,468	1,728

b. Dependent Variable: Positive effects of innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	903,092	1	903,092	148,310	,000 ^b
	Residual	19357,666	3179	6,089		
	Total	20260,758	3180			

b. Predictors: (Constant), Ideas from employees

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4,693	,105		44,834	,000
	Ideas from employees	,847	,070	,211	12,178	,000

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4,69	6,39	5,85	,533	3273
Residual	-6,388	4,307	,011	2,464	3181
Std. Predicted Value	-2,173	1,008	,000	1,000	3273
Std. Residual	-2,589	1,746	,004	,998	3181

a. Dependent Variable: Positive effects of innovation

APPENDIX 6: Full output for multiple regression analysis of Hypothesis 1

Descriptive Statistics

	Mean	Std. Deviation	N
Positive effects of innovation	5,85	2,524	3212
Ideas from employees	1,37	,629	3273
Size of organization	3,37	1,715	3296
Area served by the organisation	1,29	,588	3309
Management support	1,1926	,60492	3149
Top-Down decision making strategy	1,1196	,52191	2618
Favourable environment	2,0688	1,69297	2921
Barriers	1,6987	,78438	2875

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Barriers, Size of organization, Ideas from employees, Area served by the organisation, Management support, Top-Down decision making strategy, Favourable environment ^b		Enter

a. Dependent Variable: Positive effects of innovation

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,428 ^a	,183	,181	2,285	1,819

a. Predictors: (Constant), Barriers, Size of organization, Ideas from employees, Area served by the organisation, Management support, Top-Down decision making strategy, Favourable environment

b. Dependent Variable: Positive effects of innovation

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
-------	----------------	----	-------------	---	------

1	Regression	2747,351	7	392,479	75,184	,000 ^b
	Residual	12257,079	2348	5,220		
	Total	15004,430	2355			

a. Dependent Variable: Positive effects of innovation

b. Predictors: (Constant), Barriers, Size of organization, Ideas from employees, Area served by the organisation, Management support, Top-Down decision making strategy, Favourable environment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,807	,198		14,162	,000
	Ideas from employees	,534	,078	,133	6,840	,000
	Size of organization	,202	,031	,137	6,550	,000
	Area served by the organisation	,027	,082	,006	,327	,744
	Management support	,504	,084	,121	6,028	,000
	Top-Down decision making strategy	,457	,100	,095	4,564	,000
	Favourable environment	,322	,031	,216	10,320	,000
	Barriers	-,106	,066	-,033	-1,625	,104

a. Dependent Variable: Positive effects of innovation

APPENDIX 7: Full output for bivariate regression analysis of Hypothesis 2

Descriptive Statistics

	Mean	Std. Deviation	N
Ideas from employees	1,37	,629	3273
Incentives	2,06	,741	3258

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Incentives ^b	.	Enter

a. Dependent Variable: Ideas from employees

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,237 ^a	,056	,056	,611	1,832

a. Predictors: (Constant), Incentives

b. Dependent Variable: Ideas from employees

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71,501	1	71,501	191,505	,000 ^b
	Residual	1204,475	3226	,373		
	Total	1275,976	3227			

a. Dependent Variable: Ideas from employees

b. Predictors: (Constant), Incentives

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,953	,032		30,001	,000
	Incentives	,201	,015	,237	13,839	,000

a. Dependent Variable: Ideas from employees

APPENDIX 8: Full output for bivariate regression analysis of Hypothesis 3

Descriptive Statistics

	Mean	Std. Deviation	N
Ideas from employees	1,37	,629	3273
Workforce skills	2,235	1,0630	3226

Correlations

		Ideas from employees	Workforce skills
Pearson Correlation	Ideas from employees	1,000	,160
	Workforce skills	,160	1,000
Sig. (1-tailed)	Ideas from employees	.	,000
	Workforce skills	,000	.
N	Ideas from employees	3273	3190
	Workforce skills	3190	3226

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Workforce skills ^b	.	Enter

a. Dependent Variable: Ideas from employees

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,160 ^a	,026	,025	,621	1,852

a. Predictors: (Constant), Workforce skills

b. Dependent Variable: Ideas from employees

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32,362	1	32,362	83,974	,000 ^b
	Residual	1228,589	3188	,385		
	Total	1260,951	3189			

a. Dependent Variable: Ideas from employees

b. Predictors: (Constant), Workforce skills

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,155	,026		45,106	,000
	Workforce skills	,095	,010	,160	9,164	,000

APPENDIX 9: Full output for bivariate regression analysis of Hypothesis 4

Descriptive Statistics

	Mean	Std. Deviation	N
Ideas from employees	1,37	,629	3273
Education	2,38	1,523	3047

Correlations

		Ideas from employees	Education
Pearson Correlation	Ideas from employees	1,000	,063
	Education	,063	1,000
Sig. (1-tailed)	Ideas from employees	.	,000
	Education	,000	.
N	Ideas from employees	3273	3013
	Education	3013	3047

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Education ^b	.	Enter

a. Dependent Variable: Ideas from employees

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,063 ^a	,004	,004	,628	1,844

a. Predictors: (Constant), Education

b. Dependent Variable: Ideas from employees

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,783	1	4,783	12,140	,001 ^b
	Residual	1186,181	3011	,394		
	Total	1190,964	3012			

a. Dependent Variable: Ideas from employees

b. Predictors: (Constant), Education

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,304	,021		61,419	,000
	Education	,026	,008	,063	3,484	,001

APPENDIX 10: Full output for multiple regression analysis of Hypotheses 2, 3, 4

Descriptive Statistics

	Mean	Std. Deviation	N
Ideas from employees	1,37	,629	3273
Incentives	2,06	,741	3258
Workforce skills	2,235	1,0630	3226
Education	2,38	1,523	3047
Size of organization	3,37	1,715	3296
Area served by the organisation	1,29	,588	3309
Management support	1,1926	,60492	3149
Top-Down decision making strategy	1,1196	,52191	2618
Favourable environment	2,0688	1,69297	2921
Barriers	1,6987	,78438	2875

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Barriers, Incentives, Size of organization, Area served by the organisation, Workforce skills, Management support, Education, Top-Down decision making strategy, Favourable environment ^b		Enter

a. Dependent Variable: Ideas from employees

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,348 ^a	,121	,118	,591	1,920

a. Predictors: (Constant), Barriers, Incentives, Size of organization, Area served by the organisation, Workforce skills, Management support, Education, Top-Down decision making strategy, Favourable environment;

b. Dependent Variable: Ideas from employees

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113,025	9	12,558	36,010	,000 ^b
	Residual	818,157	2346	,349		
	Total	931,182	2355			

a. Dependent Variable: Ideas from employees

b. Predictors: (Constant), Barriers, Incentives, Size of organization, Area served by the organisation, Workforce skills, Management support, Education, Top-Down decision making strategy, Favourable environment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,440	,060		7,349	,000
	Incentives	,166	,017	,195	9,609	,000
	Workforce skills	,046	,012	,078	3,711	,000
	Education	,003	,009	,006	,293	,769
	Size of organization	,024	,008	,064	2,930	,003
	Area served by the organisation	,039	,022	,037	1,768	,077
	Management support	,152	,022	,146	6,841	,000
	Top-Down decision making strategy	,087	,026	,072	3,353	,001
	Favourable environment	-,006	,008	-,016	-,710	,477
	Barriers	,047	,017	,058	2,701	,007

a. Dependent Variable: Ideas from employees

APPENDIX 11: Full output for mediation analysis of Hypothesis 5

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Release 2.13 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
 Documentation available in Hayes (2013). www.guilford.com/p/hayes3

Model = 4
 Y = Eff_SUM
 X = ManSupC
 M = q14_b

Statistical Controls:

CONTROL= StratCom FavEnv BarrComp q17_c WSkills q8 d1 d4

Sample size
 1934

Outcome: q14_b

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,3447	,1188	,3421	28,8215	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	,4723	,0669	7,0641	,0000	,3412	,6034
ManSupC	,1316	,0242	5,4492	,0000	,0842	,1790
StratCom	,1046	,0286	3,6547	,0003	,0485	,1607
FavEnv	-,0070	,0090	-,7732	,4395	-,0246	,0107
BarrComp	,0325	,0191	1,7072	,0879	-,0048	,0699
q17_c	,1780	,0192	9,2816	,0000	,1404	,2156
WSkills	,0478	,0136	3,5216	,0004	,0212	,0745
q8	,0045	,0098	,4646	,6423	-,0146	,0237
d1	,0203	,0091	2,2310	,0258	,0025	,0382
d4	,0263	,0261	1,0081	,3135	-,0248	,0774

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4869	,2371	4,7568	59,7710	10,0000	1923,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,1237	,2525	8,4098	,0000	1,6284	2,6190
q14_b	,3777	,0850	4,4426	,0000	,2110	,5444
ManSupC	,2810	,0908	3,0963	,0020	,1030	,4590
StratCom	,3230	,1071	3,0174	,0026	,1131	,5330
FavEnv	,2707	,0336	8,0512	,0000	,2047	,3366
BarrComp	-,1209	,0711	-1,6993	,0894	-,2604	,0186

q17_c	,1488	,0731	2,0363	,0419	,0055	,2922
WSkills	,6293	,0508	12,3813	,0000	,5297	,7290
q8	-,1275	,0364	-3,5059	,0005	-,1988	-,0562
d1	,1638	,0340	4,8170	,0000	,0971	,2305
d4	,1853	,0972	1,9072	,0566	-,0052	,3759

***** TOTAL EFFECT MODEL *****

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4788	,2293	4,8031	63,5999	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,3021	,2505	9,1890	,0000	1,8108	2,7934
ManSupC	,3307	,0905	3,6542	,0003	,1532	,5082
StratCom	,3625	,1072	3,3816	,0007	,1523	,5728
FavEnv	,2680	,0338	7,9356	,0000	,2018	,3343
BarrComp	-,1086	,0714	-1,5203	,1286	-,2486	,0315
q17_c	,2161	,0719	3,0069	,0027	,0751	,3570
WSkills	,6474	,0509	12,7160	,0000	,5476	,7473
q8	-,1258	,0365	-3,4424	,0006	-,1974	-,0541
d1	,1715	,0341	5,0248	,0000	,1046	,2384
d4	,1953	,0976	2,0001	,0456	,0038	,3867

***** TOTAL, DIRECT, AND INDIRECT EFFECTS *****

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,3307	,0905	3,6542	,0003	,1532	,5082

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,2810	,0908	3,0963	,0020	,1030	,4590

Indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0497	,0156	,0244	,0869

Partially standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0226	,0071	,0110	,0393

Completely standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0125	,0039	,0061	,0218

Ratio of indirect to total effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,1503	,1901	,0635	,3884

Ratio of indirect to direct effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,1769	,7958	,0672	,6188

Normal theory tests for indirect effect

Effect	se	Z	p
,0497	,0146	3,4090	,0007

***** ANALYSIS NOTES AND WARNINGS *****

Number of bootstrap samples for bias corrected bootstrap confidence intervals:
10000

Level of confidence for all confidence intervals in output:
95,00

NOTE: Some cases were deleted due to missing data. The number of such cases was:
1376

----- END MATRIX -----

APPENDIX 12: Full output for mediation analysis of Hypothesis 6

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Release 2.13 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
 Documentation available in Hayes (2013). www.guilford.com/p/hayes3

Model = 4
 Y = Eff_SUM
 X = StratCom
 M = q14_b

Statistical Controls:

CONTROL= FavEnv BarrComp ManSupC q17_c WSkills q8 d1 d4

Sample size
 1934

Outcome: q14_b

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,3447	,1188	,3421	28,8215	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	,4723	,0669	7,0641	,0000	,3412	,6034
StratCom	,1046	,0286	3,6547	,0003	,0485	,1607
FavEnv	-,0070	,0090	-,7732	,4395	-,0246	,0107
BarrComp	,0325	,0191	1,7072	,0879	-,0048	,0699
ManSupC	,1316	,0242	5,4492	,0000	,0842	,1790
q17_c	,1780	,0192	9,2816	,0000	,1404	,2156
WSkills	,0478	,0136	3,5216	,0004	,0212	,0745
q8	,0045	,0098	,4646	,6423	-,0146	,0237
d1	,0203	,0091	2,2310	,0258	,0025	,0382
d4	,0263	,0261	1,0081	,3135	-,0248	,0774

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4869	,2371	4,7568	59,7710	10,0000	1923,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,1237	,2525	8,4098	,0000	1,6284	2,6190
q14_b	,3777	,0850	4,4426	,0000	,2110	,5444
StratCom	,3230	,1071	3,0174	,0026	,1131	,5330
FavEnv	,2707	,0336	8,0512	,0000	,2047	,3366
BarrComp	-,1209	,0711	-1,6993	,0894	-,2604	,0186
ManSupC	,2810	,0908	3,0963	,0020	,1030	,4590
q17_c	,1488	,0731	2,0363	,0419	,0055	,2922

WSkills	,6293	,0508	12,3813	,0000	,5297	,7290
q8	-,1275	,0364	-3,5059	,0005	-,1988	-,0562
d1	,1638	,0340	4,8170	,0000	,0971	,2305
d4	,1853	,0972	1,9072	,0566	-,0052	,3759

***** TOTAL EFFECT MODEL *****
 Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4788	,2293	4,8031	63,5999	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,3021	,2505	9,1890	,0000	1,8108	2,7934
StratCom	,3625	,1072	3,3816	,0007	,1523	,5728
FavEnv	,2680	,0338	7,9356	,0000	,2018	,3343
BarrComp	-,1086	,0714	-1,5203	,1286	-,2486	,0315
ManSupC	,3307	,0905	3,6542	,0003	,1532	,5082
q17_c	,2161	,0719	3,0069	,0027	,0751	,3570
WSkills	,6474	,0509	12,7160	,0000	,5476	,7473
q8	-,1258	,0365	-3,4424	,0006	-,1974	-,0541
d1	,1715	,0341	5,0248	,0000	,1046	,2384
d4	,1953	,0976	2,0001	,0456	,0038	,3867

***** TOTAL, DIRECT, AND INDIRECT EFFECTS *****

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,3625	,1072	3,3816	,0007	,1523	,5728

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,3230	,1071	3,0174	,0026	,1131	,5330

Indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0395	,0139	,0166	,0730

Partially standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0180	,0064	,0075	,0331

Completely standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0084	,0029	,0035	,0154

Ratio of indirect to total effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,1089	,7475	,0407	,3249

Ratio of indirect to direct effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,1223	6,4383	,0421	,4746

Normal theory tests for indirect effect

Effect	se	Z	p
,0395	,0142	2,7807	,0054

***** ANALYSIS NOTES AND WARNINGS *****

Number of bootstrap samples for bias corrected bootstrap confidence intervals:
10000

Level of confidence for all confidence intervals in output:
95,00

NOTE: Some cases were deleted due to missing data. The number of such cases was:
1376

----- END MATRIX -----

APPENDIX 13: Full output for mediation analysis of Hypothesis 7

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Release 2.13 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
 Documentation available in Hayes (2013). www.guilford.com/p/hayes3

Model = 4
 Y = Eff_SUM
 X = FavEnv
 M = q14_b

Statistical Controls:

CONTROL= BarrComp StratCom ManSupC q17_c WSkills q8 d1 d4

Sample size
 1934

Outcome: q14_b

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,3447	,1188	,3421	28,8215	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	,4723	,0669	7,0641	,0000	,3412	,6034
FavEnv	-,0070	,0090	-,7732	,4395	-,0246	,0107
BarrComp	,0325	,0191	1,7072	,0879	-,0048	,0699
StratCom	,1046	,0286	3,6547	,0003	,0485	,1607
ManSupC	,1316	,0242	5,4492	,0000	,0842	,1790
q17_c	,1780	,0192	9,2816	,0000	,1404	,2156
WSkills	,0478	,0136	3,5216	,0004	,0212	,0745
q8	,0045	,0098	,4646	,6423	-,0146	,0237
d1	,0203	,0091	2,2310	,0258	,0025	,0382
d4	,0263	,0261	1,0081	,3135	-,0248	,0774

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4869	,2371	4,7568	59,7710	10,0000	1923,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,1237	,2525	8,4098	,0000	1,6284	2,6190
q14_b	,3777	,0850	4,4426	,0000	,2110	,5444
FavEnv	,2707	,0336	8,0512	,0000	,2047	,3366
BarrComp	-,1209	,0711	-1,6993	,0894	-,2604	,0186
StratCom	,3230	,1071	3,0174	,0026	,1131	,5330

ManSupC	,2810	,0908	3,0963	,0020	,1030	,4590
q17_c	,1488	,0731	2,0363	,0419	,0055	,2922
WSkills	,6293	,0508	12,3813	,0000	,5297	,7290
q8	-,1275	,0364	-3,5059	,0005	-,1988	-,0562
d1	,1638	,0340	4,8170	,0000	,0971	,2305
d4	,1853	,0972	1,9072	,0566	-,0052	,3759

***** TOTAL EFFECT MODEL *****

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4788	,2293	4,8031	63,5999	9,0000	1924,0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,3021	,2505	9,1890	,0000	1,8108	2,7934
FavEnv	,2680	,0338	7,9356	,0000	,2018	,3343
BarrComp	-,1086	,0714	-1,5203	,1286	-,2486	,0315
StratCom	,3625	,1072	3,3816	,0007	,1523	,5728
ManSupC	,3307	,0905	3,6542	,0003	,1532	,5082
q17_c	,2161	,0719	3,0069	,0027	,0751	,3570
WSkills	,6474	,0509	12,7160	,0000	,5476	,7473
q8	-,1258	,0365	-3,4424	,0006	-,1974	-,0541
d1	,1715	,0341	5,0248	,0000	,1046	,2384
d4	,1953	,0976	2,0001	,0456	,0038	,3867

***** TOTAL, DIRECT, AND INDIRECT EFFECTS *****

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,2680	,0338	7,9356	,0000	,2018	,3343

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
,2707	,0336	8,0512	,0000	,2047	,3366

Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
q14_b	-,0026	,0036	-,0107	,0038

Partially standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
q14_b	-,0012	,0016	-,0048	,0017

Completely standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
q14_b	-,0017	,0024	-,0071	,0025

Ratio of indirect to total effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
q14_b	-,0098	,0139	-,0432	,0138

Ratio of indirect to direct effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
q14_b	-,0097	,0136	-,0414	,0140

Normal theory tests for indirect effect

Effect	se	Z	p
--------	----	---	---

-,0026 ,0035 -,7436 ,4571

***** ANALYSIS NOTES AND WARNINGS *****

Number of bootstrap samples for bias corrected bootstrap confidence intervals:

10000

Level of confidence for all confidence intervals in output:

95,00

NOTE: Some cases were deleted due to missing data. The number of such cases was:

1376

----- END MATRIX -----

APPENDIX 14: Full output for mediation analysis of Hypothesis 8

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Release 2.13 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
 Documentation available in Hayes (2013). www.guilford.com/p/hayes3

Model = 4
 Y = Eff_SUM
 X = BarrComp
 M = q14_b

Statistical Controls:

CONTROL= FavEnv StratCom ManSupC q17_c WSkills q8 d1 d4

Sample size
 1934

Outcome: q14_b

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,3447	,1188	,3421	28,8215	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	,4723	,0669	7,0641	,0000	,3412	,6034
BarrComp	,0325	,0191	1,7072	,0879	-,0048	,0699
FavEnv	-,0070	,0090	-,7732	,4395	-,0246	,0107
StratCom	,1046	,0286	3,6547	,0003	,0485	,1607
ManSupC	,1316	,0242	5,4492	,0000	,0842	,1790
q17_c	,1780	,0192	9,2816	,0000	,1404	,2156
WSkills	,0478	,0136	3,5216	,0004	,0212	,0745
q8	,0045	,0098	,4646	,6423	-,0146	,0237
d1	,0203	,0091	2,2310	,0258	,0025	,0382
d4	,0263	,0261	1,0081	,3135	-,0248	,0774

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4869	,2371	4,7568	59,7710	10,0000	1923,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,1237	,2525	8,4098	,0000	1,6284	2,6190
q14_b	,3777	,0850	4,4426	,0000	,2110	,5444
BarrComp	-,1209	,0711	-1,6993	,0894	-,2604	,0186
FavEnv	,2707	,0336	8,0512	,0000	,2047	,3366
StratCom	,3230	,1071	3,0174	,0026	,1131	,5330
ManSupC	,2810	,0908	3,0963	,0020	,1030	,4590

q17_c	,1488	,0731	2,0363	,0419	,0055	,2922
WSkills	,6293	,0508	12,3813	,0000	,5297	,7290
q8	-,1275	,0364	-3,5059	,0005	-,1988	-,0562
d1	,1638	,0340	4,8170	,0000	,0971	,2305
d4	,1853	,0972	1,9072	,0566	-,0052	,3759

***** TOTAL EFFECT MODEL *****

Outcome: Eff_SUM

Model Summary

	R	R-sq	MSE	F	df1	df2
p	,4788	,2293	4,8031	63,5999	9,0000	1924,0000
	,0000					

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,3021	,2505	9,1890	,0000	1,8108	2,7934
BarrComp	-,1086	,0714	-1,5203	,1286	-,2486	,0315
FavEnv	,2680	,0338	7,9356	,0000	,2018	,3343
StratCom	,3625	,1072	3,3816	,0007	,1523	,5728
ManSupC	,3307	,0905	3,6542	,0003	,1532	,5082
q17_c	,2161	,0719	3,0069	,0027	,0751	,3570
WSkills	,6474	,0509	12,7160	,0000	,5476	,7473
q8	-,1258	,0365	-3,4424	,0006	-,1974	-,0541
d1	,1715	,0341	5,0248	,0000	,1046	,2384
d4	,1953	,0976	2,0001	,0456	,0038	,3867

***** TOTAL, DIRECT, AND INDIRECT EFFECTS *****

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
-,1086	,0714	-1,5203	,1286	-,2486	,0315

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
-,1209	,0711	-1,6993	,0894	-,2604	,0186

Indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0123	,0083	-,0014	,0323

Partially standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0056	,0038	-,0007	,0147

Completely standardized indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	,0039	,0027	-,0005	,0104

Ratio of indirect to total effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	-,1132	8,7678	-3,4050	,1437

Ratio of indirect to direct effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI	
q14_b	-,1017	4,1251	-1,8520	,0792

Normal theory tests for indirect effect

Effect	se	Z	p
,0123	,0079	1,5596	,1189

***** ANALYSIS NOTES AND WARNINGS *****

Number of bootstrap samples for bias corrected bootstrap confidence intervals:
10000

Level of confidence for all confidence intervals in output:
95,00

NOTE: Some cases were deleted due to missing data. The number of such cases was:
1376

----- END MATRIX -----